amateur
73 radio

ACE
#124
One Dollar
January
1971

EMPHASIS: DX

DXing in Luxembourg

Eyeball DXing

EXCLUSIVE:

[illegible] supplement to Amateur Study Guide

SPECIAL REPORT:

RIG MAKERS FACE CRISIS

Issue #124

Amateur Radio 73

January, 1971

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NEVER SAY DIE

The amateur radio market has been too small to really encourage the Japanese to tool up for massive competition until just recently. Now we are seeing more and more Japanese products appearing in the ads.

The first major import was the Yaesu sideband transceiver brought in by Spectronics. This was a well made unit and quite competitive with the American made equipment. Next came Henry's Tempo. Now Kenwood, one of the top names in hi-fi manufacturing, is now being imported by Henry Radio and should also become a very popular unit.

In the FM field the best known imports are the Inoue (imported by Varitronics), Telecomm, and Standard. Drake has just announced an imported transceiver designed specially for them.

Can the Japanese drive the U.S. manufacturers out of business? They've done a pretty good job of it in other areas such as transistor manufacturing, ball bearings, etc., so it is entirely possible that they might be able to take over a good portion of the U.S. ham market.

Should U.S. manufacturers go complaining to Washington and ask for protection as the makers of shoes and clothing have? Students of the complex import—export situation tell us that the minute the U.S. sets up restrictions on imports we can

The result of this is a product turned out at a price that is extremely competitive almost everywhere in the world in just about any field they wish to tackle. The Japanese government helps by limiting or even prohibiting any competition from outside Japan, thus giving the companies a captive home market as a starter. This has been quite effective as anyone familiar with the camera, clothes, automobile, radio, television, and hi-fi markets will attest.

The car market is an interesting example of the ability of the Japanese to develop a strong export market. In 1955 Japan exported two cars. Just two. In 1960 this was up to 7000 cars exported to all countries. In 1965 they exported 101,716 Toyotas and Datsuns, of which 27,460 came to the U.S. In 1966 they sent 53,272 to the U.S. It only went up to 71,625 in 1967, a slow year, and up to 172,728 in 1968. In 1969 this was up to 168,070 passenger cars to the U.S!

A similar pattern occurred in the camera field, the transistor radio field, and others. Will this happen to the amateur radio business? The pattern certainly seems to be repeating itself.

Women's Lib II

My editorial comments on the Lib movement were not in any way intended to cast aspersions on any gals, and particular-

by Herter's the world over. The word "Point" on name was originally put in to indicate the value in beaver skins. Order out a pair today. . ."

The description goes on to explain that only the most expensive bull-hide leather is used and that only one hide in 200 is free enough from tick bites and flaws to go into these shoes.

The price of these fantastic shoes? Only $14.95. Who could pass up a bargain like that? Not me, for sure. I sent off for a pair and found them to be the most comfortable shoes I had had in years. I used them for hiking around New Hampshire, wore them on my safari in Africa, wore them around the world, and continued to wear them. They showed no signs of wearing out in any way.

Comfortable shoes have been difficult for me to find in the past so I had gotten in the practice of getting a second pair of any shoes that worked out well. I sent for a second pair of Herter's shoes and put them on the shelf. The first pair is now about five years old, has been worn almost every day, has taken me out on hunting trips, through mud, rain, snow, mountain climbing, hikes, and still fit comfortably, with no sign of wearing out or coming apart at the seams. The second pair is still up on the shelf. I may not live long enough to get to them.

How is 220 Coming?

The prospects look bright for the Radio Today petition to open several hundred channels in the middle four MHz of the amateur 220 MHz band for a hobby-type amateur license which would be based upon a knowledge of rules and regulations only.

CB Magazine has come out in support of the petition (now known as RM-1633), adding a proposed change which would permit AM as well as the proposed FM operation. I can only assume that this is because the editor is not that familiar with FM, for the use of AM would go a long way towards duplicating the chaos now heard on 11 meters. The AM idea is supposed to make it simpler to use units which would convert CB gear to the new band. This can be done, of course, but the extra cost of having the converter provide the desired FM would be slight and the advantages manifold.

S-9 Magazine seems to like the idea also, but in their usually underhanded way they ascribed the petition to our greed which, if I read them rightly, has no known bounds. This is incorrect. Our greed knows bounds.

. . .W2NSD/1

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import—export situation tell us the Lib movement were not in

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that the minute the U.S. sets up restrictions on imports we can expect a rash of ditto from other countries and that the result will be far worse than any possible benefits we might gather from restricting imports. The problem is Japan, of course, and it would not seem out of line to reciprocate the Japanese protective system which limits imports on many items.

Perhaps Drake has the best compromise, having their FM unit built in Japan and marketed here by their organization?

Why is it that the Japanese are able to compete so tellingly with U.S. companies? Most of the ICs are being made in the U.S. This means that the Japanese firm must by ICs from us, import virtually all of the raw materials, and then ship the finished product all the way back to us. In addition to the ocean or air freight on the product there is the markup of the importer, plus import taxes. In spite of all this expense, the imported products are still priced considerably below our own units of comparable quality . . . how is this possible?

The secret is, of course, the whole Japanese way of life. The productivity of the Japanese worker is far beyond that of most any other worker in the world. He joins a company for life and devotes his life to that company. He plans his own time so as to be sure that he will bring the best of health and energy to his job. He and his union work with management to effect the most efficient production of the product using the latest automation techniques (as opposed to many U.S. unions which do everything possible to prevent automation).

any way intended to cast aspersions on any gals, and particularly not our ex-editor Kayla, who did a man-sized job of tiding 73 over a very rough period.

Consumer Protection Department

One of the most delightful books in the 73 library is a catalog from Herter's in Waseca, Minnesota. This sporting goods mail order firm puts out a 650-page catalog that is highly entertaining. If you believe the catalog, just about everything they carry is the finest available anywhere at any price. Many of the items are made specially for Herter's and their described magnificence is overwhelming.

Strangely, though I have succumbed to many of their descriptions, I have yet to catch them exaggerating. For instance, take their Herter's Genuine Hudson Bay One Point Shoes, Men's. These are described as "the finest Oxford cut wilderness shoe procurable. Made of hand worked leather. Require no break-in. These world famous custom shoes are entirely hand cut and hand made. They are the French Canadian Moccasin in Sauvage shoe and not quite a newcomer. They have been proven the best for nearly two centuries. Do not mistake these famous shoes for so-called 'sport moccasins' production made of cheap leather. Such shoes stretch out of shape and come apart under rough use and will ruin your feet on rough terrain. Hudson Bay One Point Shoes are made for guides, forest rangers, trappers, game wardens, timber cruisers, scalers, and other professional outdoor people who want a low shoe for summer wear. Hudson Bay shoes are now solely distributed

The Cover: Jodi WA1JYV — our cover girl — can be found just about any time on 50.55 MHz usually mobile. Her VW bug has a Lafayette HA 460 crammed into its innards and sports a Saturn-6 halo. Jodi's halo doesn't show up well in bright sun. . .and this angel's technical statistics are classified.

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Amateur Radio News Page

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JAP INDUSTRY GETS TABLES TURNED!

CLAIMS U.S. UNFAIR!

For years the Japanese electronics industry has been the target of U.S. charges of "dumping," or selling items in the United States at prices that are below the market price in Japan. The effect of such tactics, say U.S. manufacturers, is to squeeze legitimate businesses here out of competition. But the Japanese electronics industry industry has been pooh-poohing the cries or ignoring them altogether.

But now the tide has changed a bit, according to a series of news items in Business Week, a McGraw-Hill publication. The Japanese manufacturers of integrated circuits are finding themselves squeezed out even in sales within Japan—and they're accusing American firms of the same "dumping" tactic. They say American IC and transistor manufacturers are dumping large quantities of semiconductors on the market at prices too low for the Japanese to compete.

Toshiba's president, Toshio Doko, said his firm has had to cut its prices sharply to compete with U.S. IC prices. Industry spokesmen here, however, label the "dumping" charge as ridiculous. It is merely a matter of production efficiency. In the U.S., because of increasing production and higher product re-

SALEM CIVIL DEFENSE GOES FM

The Salem RACES mobile units are equipped with Galaxy FM-210 transceivers which proved to give excellent coverage throughout the town. Civil Defense communications act as back up units for police and fire departments when needed as well as a separate communications network to be used in any local emergency. In the rear of the photo is the new Civil Defense antenna system which gives coverage for the town and to Rockingham County Civil Defense Sector headquarters. Salem is thought to be the first town in New Hampshire to go completely FM for Civil Defense Communications. Shown in front of the Salem police station, which also houses Salem civil defense headquarters, are members of the Salem civil defense RACES communications team with their mobile radio units. Left to right are: Melvin Marsh, CD Director, Merle Centner W8AOT, Samuel Burke WA1MOF, Warren Martel K1RCT, William Loeffler W1PFA, Communications Director, Donald Alexander W1UFK, Radio Officer, Anthony Coco K11LB, Radio Officer, and Kenneth Cheverie, W1QKG.

HAM HELPS SAVE A LIFE

New Orleans (AP) — A New Orleans ham radio operator's quick action enabled doctors to get snake-bite serum and save the life of a Colombian youth.

Eugene H. Treadaway said that he had talked by radio with a ham in Cucuta, Colombia, who had told him that the 5-year-old child had received the serum.

"Doctors said the serum saved the little boy's life," Mr. Treadaway quoted the Colombian ham as saying. "They say he is going to be okay and they won't have to amputate his leg."

Mr. Treadaway was on his short-wave radio when James H. Stiles, the Colombian ham, broke in on his frequency and asked for help in getting the serum.

Mr. Treadaway made contact with the United States Public Health Service Hospital, where an official called the hospital's outpatient clinic in Miami and had the serum flown to Colombia.

FCC SUSPENDS

liability, individual IC prices

FAMED EME SITE

U.S., because of increasing production and higher product reliability, individual IC prices have been dropping.

According to one of the Business Week news items, Japanese consumers have been "incensed" to learn that a TV set made in Japan to sell (in Japan) for $500, can be purchased in the United States for about $200. While this may serve as reasonable agitation for the Japanese consumer, it has proved a real thorn in the side of U.S. manufacturers, who must either make their own sets to compete with the imports, or give up the manufacturing of them altogether and join the importing game themselves.

It is not surprising that American electronics manufacturers are amused now that the shoe is on the other foot.

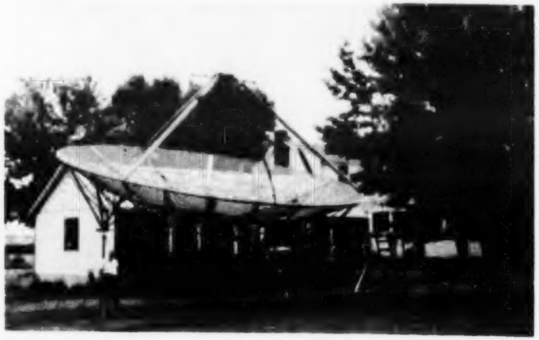
any local emergency. In the rear of the photo is the new Civil civil defense headquarters, are members of the Salem civil de- K1TLB, Radio Officer, and Kenneth Cheverie, W1QKG.

FAMED EME SITE TO BE DISMANTLED

by WA3AJR

Bill Smith (W3GKP) was the first ham radio operator to make EME (moonbounce) on 2304 MHz, and he didn't do it with an ordinary dipole. As the photo shows, it takes a real antenna. The approximate size of the big dish can be estimated by comparing it with Bill himself, who is standing at the lower right. In this picture, he is actually closer to the camera than the dish itself.

According to Smitty, he will be leaving the area soon, and the historic site will be no more. The dish? It goes with Smitty, of course!



HAM'S CALL RESCUES STRANDED FAMILY

Heber City, Utah (AP) — A North Carolina ham radio operator recently relayed distress signals from northeastern Utah's high mountain country and helped in the rescue of a Salt Lake City couple and their two children.

The authorities said that Mr. and Mrs. Phillip Gordon and their children were stranded on a mountain road when their pickup camper got stuck in mud.

Distress signals from their short-wave radio were unable to reach nearby Heber City or Salt Lake City because of the mountains. So Mr. Gordon aimed the signals eastward where they were picked up in North Carolina.

The North Carolina ham, who was not identified, radioed an operator in American Fork who then relayed the message to the Wasatch County Sheriff, Floyd Witt. The family was rescued.

MOON REPEATER TO PERMIT INTERCONTINENTAL UHF QSOs

by N. K. Marshall W6010/2

The design, development, and test of an operational prototype UHF amateur repeater unit is now in progress and final construction of a flight model is imminent. When completed, NASTAR hopes to have NASA carry the Moonray repeater to the moon via one of the remaining Apollo missions. One of our astronauts will emplace and activate Moonray I. Target objective is to have a continuously operational repeater for a period of one year or longer.

Moonray's primary purpose is to serve as a free-access UHF repeater for worldwide line-of-sight amateur communication and experimentation within the 450 MHz band. A secondary function will be its capability to serve as an emergency backup voice communication link for our astronauts in the event of an unlikely (but possible) breakdown or failure of their regular communications system. Moonray can also be used as a landing-site relocation beacon for homing-in on the site at some later date. If the laser experiment is successful, location accuracy will be better than 2 ft.

Moonray I will contain a highly sensitive low-noise receiver, a signal processor, an identifier, a timer-cycler-sequencer, six to eight channels of telemetry, and a laser receiver with optics. Power will be supplied by an isotope-fueled thermoelectric generator having a half-life of 87 years. Thermal controls, antenna, pointing system and all auxiliary devices will be self-contained. The final package will be a metal cylinder about the size of an oatmeal box. Three retractable legs will be used for support and leveling. The up-link frequency will be 439.9 MHz and the down-link 430.1 MHz. A 10 kHz passband on both links will accept all modes of modulation and/or transmission.

Moonray's call sign will be the identifier SS in Morse code (. . . . . .) transmitted every 10 minutes along with a telemetry sequence. Repeater operation will be on a continuous-duty basis with only one-minute interruptions each 10 minutes.

Amateur ground stations should have high-gain antennas capable of tracking the moon; low-noise 430.1 MHz crystal-controlled converters, and stable, tunable i-f's. Detailed info on Moonray is available from NASTAR, Box T, Syosset, LI NY 11791.

FCC SUSPENDS LICENSE OF WB4GTG

Obscenity, Out-of-Band, and Other Violations Cited.

The FCC moved to suspend the Advanced class lisence of Brad McGann (WB4GTG) after noting a number of alleged violations. According to a recent order from the Commission, the licensee allegedly committed the following infractions of Amateur Rules and Regulations:

Transmitting a false call sign; operating on frequencies that are reserved for Extra class operators; operating his equipment completely out of the amateur band; operating his phone station in portions of the 80-meter band that are reserved for CW transmissions only; transmitting "obscene, indecdent, or profane words, language, or meaning" in violation of Section 97.125 of the amateur rules; willfully and repeatedly interfering with other ham radio operators; and broadcasting of communications that were intended for reception by the general public.

In a quotable understatement, the FCC report said McGann's alleged actions were not serving the public "interest, convenience, and necessity." At the conclusion of the federal report, an order of suspension appeared as follows:

"It is ordered, under authority contained in Section 303(m)(1) (A), (D), and (E) of the Communications Act of 1934, as amended, and Section 0.332 of the Commission's rules, that the Advanced class amateur operator license of Bradford Y. McGann is suspended for the remainder of the license term. . ." (till September 1973).

PICTORIAL PAGE

TO THE HAMFEST BY SAIL !

by Jesse G. Ball,

In announcing the annual summer picnic and hamfest the WCARS monthly newsletter said: "Jump in your car, cycle, truck, or plane and come to our picnic and meet the whole gang."

Some of us decided to be different and arrive via sailboat. Jim (WA6MYJ), Paul (WA6VRT), Gil (WA/ULA, Joe (a nonham), and I climbed aboard the Columbia 21 and headed south out of the California coastal village of Marina Del Rey.

On board was Jim's SW 240 and Gil's Comm II. Contacts were made on 2 and 40 meters as we "broad-reached" down and "close-hauled" back. Power for the rigs was a 1.25 kW ac generator. Crew fuel was chiefly beer.

Hamfest mobile: (L to R) Joe, Jesse (W-6BFO), Paul (WA6-VRT), and Gil (WA-6ULA) thought up a novel way to get to a California hamfest. Holding the call-letter flag is Jim (WA6-MYJ).

QSL MANAGER OF THE MONTH

The very attractive Mary Ann Crider, Scott's QSL Manager of the Month, has taken on QSL manager duties for some thirteen stations over the last year and a half. These stations include CTIOF, CTILN, CT2AA, CT2AP, CR6GA, and CEØ AE -op. Father Dave, along with several others now QRT.

Mary Ann spent the first eight months of her activity as a Novice. During this time she acquired a WAC and a WAS along with 86 countries. She has to this date added 207 countries to this total and now has 285 confirmed. Her awards have also grown noticeably to include WNPX, WAC, WAS, DXCC,

HELP FOR THE NEEDY

Mohawk Airlines Stewardess and Uncle Dave delivering drugs for cancer victim. First shipment lost, duplicate shipment had to be made. The second shipment arrived in less than sixteen hours.

Operation Goodwill, the Christmas service sponsored

A first aid shipment from Albany was sent from Albany

SENTRY GETS BID FOR WORLDWIDE EXHIBIT

Sentry Manufacturing Co., a Chickasha, Oklahoma electronics has been selected by the U. S. Department of Commerce to represent the latest state of electronic technology at "Electronica CA 1970", a worldwide industry fair held in Europe every two years. The only firm so honored from Oklahoma, it is one of two in the Southwest to be invited to exhibit its products at the show held in Munich, Germany. The event is the most widely attended electronics fair in Europe and draws worldwide attendance to see the latest product state-of-the-art advances in the industry.

Sentry will display its line of precision crystals, precision temperature-compensated oscillators and its "Covistor," the tradename coined for its highly

their trouble racked moon trip.

Don Abel, president, and Peter Warren, sales manager, will attend the show. Abel revealed for the first time publicly that Sentry will also display a new series of quartz crystals developed as timing elements in wrist watches. "It will be the most accurate timing system for wrist watches known," he said.

60% EXPANSION FOR HEP LINE

Motorola has introduced 109 new semiconductors through HEP distributors to the hobby/service and radip amateur markets, accounting for a 60% increase in the electronic firm's

WNPX, WAC, WAS, DXCC,

shipment arrived in less than sixteen hours.

precision crystals, precision temperature-compensated oscil-

HEP distributors to the hobby/ service and radio amateur mar-

---

WAZ, WPW (worked Portugal world) to mention just a few. She is a member of YL International SSBers and YLRL.

Mary Ann and her husband Charles W3GE, an amateur of 32 years, have three children and two grandchildren. They have visited several countries, including Jordan, where she operated JY1 from King Hussein's station.

As QSL Manager of the Month, Mary Ann was awarded the "golden microphone" trophy. Nominations for QSL Manager of the Month should be sent to Scott's QSL Service, 1510 Lynnview, Houston TX 77055. They should include a short summary of why the manager deserved to receive the award.

NEW VHF XSTR!

Lawndale, Calif. TRW Semiconductors announces the industry's most powerful 150 MHz communications transistor. The new unit, type PT6729, delivers 120W rf power output with a 6 dB gain from a 28V source. Package is a 4-lead diamond configuration. For technical details contact TRW Semiconductor Division, Communications Transistor Plant, 14520 Aviation Blvd., Lawndale CA 90260.

Operation Goodwill, the Christmas service sponsored jointly by the Times-Union and "Uncle" Dave Marks of the now-defunct Fort Orange Radio, is usually dormant during the summer months.

But the disastrous earthquake in Peru has activated a large-scale response from the Albany area through radio contacts established by "Uncle Dave" and Operation Goodwill. With the cooperation of the Albany Rotary Club and scores of other volunteers who have been donating and shipping money and supplies to the earthquake victims, thousands of dollars worth of aid has been transmitted.

A first aid shipment from Albany was sent from Albany Airport and word was received it had arrived in Lima, Peru, just two days later. The Lima Rotary Club is responsible for distribution of the funds and supplies sent by local Rotarians.

The most important needs now are for building shelters, tents, blankets, medicine and money, according to the relief workers. More than sixty Albany Rotary members gave funds following a Thursday appeal by Uncle Dave.

Quoting a report from Albany's *Times-Union*, "It is encouraging to know that Operation Goodwill and its thousands of supporters can be counted on at a time of tragedy."

WHAT'S HAPPENING ON 220 MHz?

by K6MVH

There's a fellow out in California who's publishing a monthly newsletter describing the action in that state on 220 MHz. He says that the active groups in California would like to encourage other amateur 220 operators to speak up about what they're doing in their own areas, so that a rationale can be developed for the exchange of ideas and information.

The fellow's name is Don Farwell (WA6GYD), and his newsletter is currently being distributed without charge to other interested ops. If his circulation improves as a result of this little blurb, you can bet he'll start charging a subscription fee — it costs money to mail things these days. So why not get on his mailing list now and get the advantages of learning what circuits the 220 boys are using. In addition to short technical articles, Don's newsletter usually carries some classified ads and just enough of the hometown gossip to keep his sheet interesting.

EMPTY SHACK

Death has claimed Stanley Roberts (G6QS). Roberts was the first British amateur operator to work every one of the United States. According to his widow, the G6QS station was active every day. "Hamming was his life," she said. Stanley's fellow amateurs the world over are aggrieved by his passing.

Ninth Wheaton Swap 'n' Shop

The Wheaton Community Radio Amateurs (WCRA) will hold their ninth annual Mid-Winter Swap and Shop on Sunday, February 21, 1971 at the DuPage County Fair Grounds, Wheaton, Illinois. Hours — 8:00 a.m. to 5:00 p.m. $1.50 donation at the door. Send SASE for advanced tickets to Box QSL, Wheaton, Illinois. Refreshments and unlimited parking. Bring your own tables. Free coffee and donuts 9:00 to 9:30 a.m. Hams, CB'ers, electronic hobbyists, friends, and commercial exhibitors are cordially invited. Contact John Stockberger (W9THI).

lators and its "Covistor," the tradename coined for its highly efficient positive temperature coefficient resistors that are used in computers.

The relatively young Oklahoma electronics firm is engineering-minded and recently gained national attention when it supplied critically needed crystals under emergency conditions to aid the last minute air-ground communications with the Apollo 12 astronauts to assure a safe splashdown after

SSTV WORLDWIDE

"CQ Elettronica" Magazine proposes and sponsors the 1st Worldwide SSTV Contest to be held on Feb. 7 (0700—1400 GMT) and Feb. 13 (1600—2300 GMT). Suggested SSTV frequencies are 3.740, 7.050, 14.230, 21.100, 28.100 MHz. A pix exchange is necessary, though the message number may be given by voice.

A two-way contact with a station receives one point (total points will be the number of individual stations contacted). No extra points will be allowed for contacting the same station on different bands. A multiplier of 5 points is given for each continent worked. Score logs must contain: date, time (GMT), band, call sign, message number sent and received points.

To encourage those who have no SSTV transmitting gear, a special prize will be awarded for the best collection of photographs of received SSTV pictures. Prizes: 1st prize — One silver thaler of Maria Theresa. 2nd prize — A free 12 month's subscription to "CE Elettronica" magazine.

All logs must be received by 28th February 1971. They should be sent to Prof. Franco Fanti (I1LCF), Via Dallolio, 19; 40139 Bologna, Italy.

kets, accounting for a 60% increase in the electronic firm's number of HEP semiconductors.

"The new devices include integrated circuits, rf power transistors, FETs, Triacs, SCRs, Darlington amplifiers, and high-current rectifiers" says Art Baldensperger, Motorola HEP sales manager. "Several replacements for Japanese and other foreign transistors have also been added to the HEP line. These and other devices are all included in the latest edition of Motorola's HEP Cross Reference Guide and Catalog HMA07."

The HMA07 catalog lists HEP replacements for over 27,000 different semiconductor device type numbers, available through authorized HEP suppliers.

HEP is Motorola's sales program for making semiconductor devices readily available to experimenters and hams through a nationwide network of authorized suppliers.

40m PHONE CITATIONS

Somewhere an FCC monitoring station employee apparently noticed in the fine print (Part 97, Appx 2, Resolution 10) that foreign broadcast stations are permitted to use the 7100-7300 kHz part of the 40m amateur band as long as they do not direct their transmissions into region II (North and South America). He surmised therefrom that U.S. amateurs should in turn not communicate on 40m with the other two regions.

A number of U.S. amateurs received advisory notices after making contacts with European amateurs cross-band between the U.S. phone band and the European phone band (below 7100 kHz). Naturally, a scream went up that was heard clearly in the hallowed halls of the FCC Amateur Division in Washington and things got straightened out quickly. After a quick huddle, the Fed decided that contacts with European phone stations are still permitted on 40m phone.

DX NEWS

BOUVET ACTIVE!

A small group of Norwegians have set up on Bouvet Island on a scientific expedition and are on the air using the call 3Y3CC. They have been active on CW around 14.030—14.040 twice daily 0900—1200 and 2100—2400Z. SSB operation is expected shortly. QSLs go to LA3CC. The group is expected to be active on Bouvet until February 17th.

YEMEN STATIONS

LA8YB/4W1, operator Finn, has been contacted by a few U.S. stations, but has been concentrating more on European contacts so far. Finn is expected to be in Yemen for a year, so no reason to panic. MP4BHH has been lenging him a hand with the pileups. Finn has been on SSB mostly, even getting down on 3800 at 3200Z, but is heard more on 14.195—14.230 and even 14.332 from 1430—2000Z. 4W1AK has also been reported active on CW (14.027 at 0630Z).

TOKELAUS

VE7HE and VE8RA made a quick trip to this rare spot in late November operating as ZM7AG and ZM7AH. QSLs go to VE7BWG. This was a nice Thanksgiving present for the DX hunting contingent. ZM7 activity is indeed rare so you have to watch for quickies like this if you are going to get your country totals up into the 300s.

SUDAN

ST2SA, Sid, now has an HW-100 SSB rig and has been getting on almost daily to work away at the pileups, 14.200—.250, usually around 1430, but as late as 2300 or so at times. Sid likes lists and has been helped at times by 7Z3AB,

COCOS-KEELING

If you still need VK9YR you should look for Chris around 14.250 at 1000—1600Z and QSL to VK6RU.

MACQUARIE ISLAND

Watch for the two ops on this rremote spot using the call VKO LD, reported on around 1000—1600Z on 14.162. QSL to ZL2AFZ.

NEED NAURU?

Derrik C21GB will be there until the end of May. He operates mostly on Tuesdays and Thursdays around 14.160 about 0900Z. You'll have to call him on CW and get him to tune up for you on sideband. Another station is due to be active from Nauru before long, so don't worry too much if you have a hard time getting C21GB.

WAVE/WACAN RULES

Toronto's Nortown ARC (VE3NAR) is the sponsor of two long established and internationally famous AWARDS—WAVE (Worked All VE) and WACAN (Worked All Canada). Rules are listed below.

Rules for WAVE Award. Produce QSL cards to verify QSO with 2 different stations on 2 different bands in each of the following 9 provinces: Prince Edward Island (VE1), Nova Scotia (VE1), New Brunswick (VE1), Quebec (VE2), Ontario (VE3), Manitoba (VE4), Saskatchewan (VE5), Alberta (VE6), British Columbia (VE7); cards from Yukon and or Northwest Territories (VE8) may be substituted for British Columbia (VE7). All contacts must be made from an area within a radius of 150 miles of one point and after January 1, 1939. Submit the 18 QSL cards with $1 or 10 IRCs. Cards will be returned.

Rules for WACAN Award (for holders of WAVE Award). Produce QSL cards to verity QSO

6th ARKANSAS QSO PARTY

The North Arkansas Amateur Society of Harrison announces its sixth Arkansas QSO Party and invites all amateurs to participate.

RULES:
(1) The time will be the 30—hour period from 2200 GMT January 23 to 0400 GMT January 25.
(2) Arkansas stations score 1 point per contact and multiply by the number of states, Canadian provinces and foreign countries worked during the contest period.
(3) Outside stations score 5 points for each Arkansas station worked and multiply the total by the number of counties in Arkansas worked during the period.
(4) Stations may be worked once on each band and each mode.
(5) A certificate will be awarded to the highest-scoring station in each state, Canadian Province and foreign country with 100 or more points.
(6) General Call: "CQ ARK". Arkansas CW stations should identify themselves by signing "de (call) ARK K." Phone stations should say "Arkansas Calling."
(7) Suggested frequencies (plus or minus 5) will be: CW 3560, 7060, 14,060, 21,060, 28,060; SSB: 3960, 7260, 14,300, 21,360, 28,560; Novice: 3735, 7175, 21,110.
(8) Arkansas stations send QSO number, RS(T) and county. All other send QSO number, RS(T) and state, province or country.
(9) Logs and scores must be postmarked no later than February 9 and sent to the North Arkansas Amateur Radio Society, c/o J. K. Fancher, Jr., W5WEE, 407 Skyline Terrace, Harrison AR 72601.

FRESNO DXERS MEET

Leaky Lines

On and on, like Tennyson's brook, goes the Big Brag. The editorial policy of QST can be depended upon to voice consistently this parting over and over again, that since the "League's in its Heaven, all's right with the world." It's all very confusing.

In the November issue, the lead paragraph states "...organized amateur radio ...meaning our ARRL, and all its affiliated clubs, and all the other amateur radio societies in the world, and the International Amateur Radio Union." Is it not remarkable how deftly the editorialist has expunged from existence the hundreds of thousands who are not members of the groups cited? With a couple of masterly executed strokes of his pen, together with a few appropriate hooplas and an abracadabra or two, he has rendered them all*hors de combat* and *persona non grata*! By viewing them as nonmembers of *these* organizations, he concludes perforce, that they are consequently beyond the pale of "organized amateur radio." What would happen, one wonders, if in similar fashion the major political parties were to be silly enough to dismiss as unimportant and not deserving of inclusion in their deliberative strategy all voters who were "unorganized" because they were not regularly registered in one of the preferred parties? They would fail to win elections, and they would atrophy due to their short-sightedness.

Don't misunderstand me, please. I do not mean to imply that the U.S. delegation to the forthcoming international conference will misrepresent the interests of those hams who are not members of the League, the clubs, etc.; probably the opposite is true. In fact, I cannot conceive of any delegation from any other country represented, which will be more firmly committed to the principles which will favor amateur radio. I am merely referring to the constant failure to acknowledge publicly that there are indeed great numbers of hams whose presence on the face of

matter, how about DJ or JA? If and when you have contacted one or some of these, I'm sure you were not particuarly concerned with the composition of the government, the political persuasion or the past history of these countries. In fact, I cannot think of any amateur who would spurn a contact with a BY if he happened to hear one, despite any political considerations.

The point I'm trying to raise for a certain gent by the name of Max Sherr, who did not sign his call to a rather incoherent and fulminating letter in our November issue, is that if an amateur were to insist upon all his contacts conforming to a political accepptability test before consenting to work them, he might find himself in a position of isolation.

To regard his position of unwavering opposition to King Hussein, the fact is, as pointed out (not only here by Wayne Green, but by the Society of Friends (Quakers) who are certainly no apologists for political repression), Hussein is one of the very few in the Middle East who are seriously attempting to steer a moderate course in the baffling crisis in that unhappy area of the world. I strongly suspect, and I put it to you, that Mr. Sherr is not a bit interested in the facts, but prefers to regard *all* Arabs as enemies, for his letter is filled with half-truth, innuendo, and outright falsehood.

Apart from his departure from factual accuracy, Mr. Sherr gives the distinct impression that he feels that we should avoid all contact with those with whom we disagree, or whose politics are reprehensible to us. He leaves no doubt that he suffers with a pronounced allergy...Arabs. In this connection it is interesting to note that JY1 has been actively sought out and worked by scores of 4X4s, who would surely have more legitimate reasons for avoiding him than does Mr. Sherr! If Israeli hams can find the ability to distinguish between ham radio and politics, away at the pileups, 14.200—.250, usually around

mit the 18 QSL cards with $1 or 10 IRCs. Cards will be returned.

W5WEE, 407 Skyline Terrace, Harrison AR 72601.

the constant failure to acknowledge publicly that there are

avoiding him than does Mr. Sherr! If Israeli hams can find

1430, but as late as 2300 or so at times. Sid likes lists and has been helped at times by 7Z3AB. QSL to Box 253, Medani, Sudan. Sid appreciates help, so try and give him a hand when you hear the big boys starting to crush him in their unmerciful way.

TRAGEDY IN TONGA

VR5DK is now being operated by the widow of WA6DKW, who suffered a heart attack while on a DXpedition there in early November. Darlene has gamely taken over after OM Gene passed away. Gene Souligny and his wife (WN6FSC) had planned on operating from Tonga for about three weeks. QSL to the W6 bureau.

MALI

What may possibly be the first legitimate DX operation from Mali took place in early November when DJ6QT and DJ1QP went on with the call TZ2AB. They contacted Lloyd Colvin W6KG, who spent two fruitless months in 1967 trying to arrange for a license, that theirs was the very first license ever issued by the Mali government. This raises some questions perhaps better not asked of one or two previous "expeditions" to Mali. The team operated only a short time from Mali and then went on to operate as XT2AB from Upper Volta and TY0ACD in Dahomey. Good show.

THE GAMBIA

Look for ZD3D around 21.410 at 1800—2000 Tuesdays and 14.225 around 2200Z. Sometimes contest-style contacts, sometimes a list. QSL to VE2DCY. Good luck.

Rules for WACAN Award (for holders of WAVE Award). Produce QSL cards to verity QSO with 2 different stations on 2 different bands in each of the following 3 sections. Labrador and or Newfoundland (VO), British Columbia (VE7), Yukon and or Northwest Territories (VE8). Submit the 6 QSL cards, WAVE award No. and $1 or 10 IRCs. Cards will be returned.

CASCADES CLUB REVIEWS CRASH DRILL

A simulated airplane crash and emergency alert review was the primary topic of discussion at the latest monthly meeting of the Cascades Amateur Radio Society. CARS members were stationed at Parkside High School, the site of the simulated crash, and Foote, Mercy and Osteopathic Hospitals. Utilizing mobile and portable ham radio equipment, they provided the only two-way communication between the various hospitals and the emergency site.

Lt. Col. O. V. Best, former Jackson County civil defense director in charge of the drill, said the communications provided by CARS members was much improved over former drills. This was the first civil defense drill in which CARS members participated.

Two CARS members were present at each location, and used regular AM and SSB equipment on the 10m band.

Radio communications for the alert was accomplished under adverse conditions. A worldwide ham radio contest involving literally thousands of amateur radio operators was being held on the same simulated-emergency frequency. This fact illustrated to CARS members that they could operate under less-than-ideal emergency conditions and maintain effective two-way communications.

FRESNO DXERS MEET

The annual Fresno DX convention will be held on January 30 and 31. For registration information, write K6RQ, Frank Glass, 14910 Bascom, Los Gatos, CA 95030.

W8 Swappers!

Blossomland Amateur Radio Association's 4th annual auction and Swap-Shop will be held at Shadowland Ballroom, St. Joseph-Benton Harbor, Mich. Sunday, March 14th 9:00 a.m. to 4:00 p.m. Hot Food. Prefer to do your own selling? Rent one of our swap tables. If that fails, let our skilled auctioneer put your gear on the block. Direct inquiries to BARA, Box 175, St. Joseph MI 49085.

WA0SKP SUSPENDED

The FCC has released an order suspending the amateur license of Thomas Berryhill. In a full-page report disclosed to 73 News, the FCC's legal advisory chief, J. Russel Smith, said that Berryhill (WA0SKP) appeared to have violated a number of FCC rules. The order alleged that Berryhill operated amateur radio station WA0SKP without identifying it at the beginning and end of each single transmission or exchange of transmissions and at proper intervals, and that he operated on the frequencies 7320, 7325, 7360, 7415 and 7450 kHz, all of which are out of the band. Accordingly, the report stated: "It is ordered, under the authority contained in Section 303(m)(1)(A) of the Communications Act of 1934.

indeed great numbers of hams whose presence on the face of this planet is systematically ignored in the writings of this worthy gentleman, as though they simply did not exist.

If the League, as it is often wont to proclaim, would like to grow in membership, and assuming that such growth would involve those who are presently licensed, rather than those yet to come, this neglectful oversight is hardly likely to endear it (ARRL) and impel them with any burning desire to join us.

The last part of the editorial reads, ". . .your membership in the League helps immeasurably in this defense. . ." (meaning amateur privileges; my definition) "without it, and the support of tens of thousands of your fellow members, the outcome would most certainly be less favorable to our cause." If this is true, then how much stronger would this cause be served if the League would make itself aware that there is a body of amateurs actually functioning — living and breathing, and yes, operating their stations — who are not even considered important enough to be mentioned within the context of an editorial relating directly to their privilege also.

One constantly hears outraged and indignant accusations of attempting to undermine the ARRL. One is constantly suspected of tearing down the foundations of the League in order to help a certain nameless editor sell more copies of a specific unmentionable magazine. But not one of these zealous guardians, the protectors of the League against the unprincipled attack of these dastardly and treasonous villains, ever stands up in defense of the huge body within the amateur community which exists outside the League. It is, as I said, very confusing.

* * *

When did you last work on EA? A CO or an SV? For that the ability to distinguish between ham radio and politics, and can make a clear distinction between the two, by what stretch of the imagination, and by what brand of Talmudic casuistry does Mr. Sherr justify his rigidity of attitude and his overtly expressed bigotry?

Another significant part of his ill-considered diatribe, however, is his condemnation of editorials which go beyond the ordinary scope of ham radio, per se. This is strange indeed, since it is precisely this which he does when he denigrates the amateur operator, JY1, simply because he happens also to be the king of the Hashemite Kingdom of Jordan! How come he suddenly goes in another direction where this particular ham radio station is concerned, and that's okay. . .but when Wayne Green does it, that's wrong?

So far as his refusal to divulge his call because he fears that assassins or terrorists may seek reprisals against him, this is merely an indication of his degree of wild-eyed prejudice. His fears of reprisal are pretty close to that condition known in abnormal psychology as paranoia.

It is a mighty good thing for everybody that most of the leaders of both sides in this terrible Mideast crisis, are not similarly motivated by rabid hatred, and are seeking some accommodation. Of course, there is a lot of power play diplomacy and pressure politics going on. . .that is nothing new to international affairs. But if the leaders in that area were as rigid and unyielding in their approach, war would be inevitable. Any refusal to put aside prejudice and an insistence on bludgeoning the opposition into submission can have but one result: a holocaust which will solve nothing.

I fear that Mr. Sherr has failed to do his homework. His "facts" leave me completely unconvinced of anything except his blind, unreasoning bigotry.

Mr Virgo Himself

Editorial by Ken Sessions

Wayne Green for President?

At a radio club meeting in Long Island, I had the chance to meet with Harry Dannals, Hudson Division director of the ARRL, and to discuss with him some of the problems and good points of the League. The discussion set me to thinking about the needs of the League and its responsibilities to members and amateurs in general. The upshot was an idea that I think is not only sensational, but a panacea for the ills of our ilk.

First, ask, "Where does the League fall short?" I won't deign to go into that question, because nearly all amateurs have different views. But following up with, "What can be done to improve amateur radio as well as the League's representation of amateur radio?" could lead to some startling insight and prospective answers.

For example, Wayne Green contends that amateur radio should be represented in Washington by a lobby. Few hams would dispute that. Wayne thinks a public relations firm should be commissioned to bring a new awareness of ham radio to the general public. This, too, makes good sense. Wayne feels that the League's executive directors should be made more responsive to the needs and demands of the members — that the League should be the voice of all amateurs, but not disconnected from the brain of those

The FM Scene

What is 146.96? When you order crystals for a local FM channel or repeater, then suddenly realize that you're transmitting a few kilohertz away from the standard, don't blame the crystal manufacturer. And don't write nasty letters to the manufacturer of the transceiver you're using. The problem? More often than not, it's a case of "double standards." What is accepted as being 146.94 in Chicago, for example, is several kHz above what the New Englanders call .94. The same has been proving true for repeaters and channels all over the country, much to the consternation of crystal and transceiver manufacturers. Before you complain to anyone about a crystal or oscillator being off frequency, do something positive about checking your own local channels. By "something positive," I mean that you should check frequencies with not less than two items of professional test equipment.

Standards for Tones. Current standards for amateur repeater use revolve around the concept of 150 Hz spacing between tone "channels." The 150 Hz spacing allows a safe "guard" band between tone frequencies to insure that users of one repeater do not trigger the facilities of another when units drift or frequencies are off a bit. The conventional tone frequencies in use for amateurs are 1650,

Caveat Emptor?

Price — $2 per 25 words for non-commercial ads; $10 per 25 words for business venture. No display ads or agency discount. Include your check with order. Deadline for ads is the 1st of the month two months prior to publication. For exmaple: January 1st is the deadline for the March issue which will be mailed on the 10th of February. Type copy. Phrase and punctuate exactly as you wish it to appear. No all-capital ads. We will be the judge of suitability of ads. Our responsibility for errors extends only to printing a correct ad in a later issue. For $1 extra we can maintain a reply box for you. We cannot check into each advertiser, so Caveat Emptor. . .

CLASSIFIED, ETC.

OSCILLOSCOPE HEWLETT-PACKARD 170B professional instrument DC-20MHZ dual channel probes and accessories complete and brand new $950. Bobby L. Duke K5DZM, 13526 Pyramid Dr., Dallas TX 75234.

100 USED TV CAMERAS excellent for ATV. Running condition $125 each; "as is" condition $75 each. Shipped in 10 days. Don Heringhaus WA8ZRZ, Rural Route 1 Box 77, Ottawa OH 45875.

QUICK-COAX 2 METER COAXIAL ANTENNA KIT. All parts and step by step instructions included $6.73. Instructions 37¢. A. C. McIntosh, Jr., P.O. Box 572, Mundelein IL 60060.

450 MHZ FM BASE, RCA 20 watts, C.O.R., A-F Hybrid for repeat, Disc. Meter, Multi-position Meter, Table Top Units, $125. K2LIU, R.D. 3, Freehold NJ 07728.

SELL: Swan 350C with AC Supply, asking $350; Swan DC Module $40; Mars Oscillator $40; Hy Gain 14AVQ vertical Antenna $35; Budd Code Practice Oscillator $10; John Fearon, 3384 Peachtree Rd., N.E., Suite 705, Atlanta GA 30326. W4WKP.

NEED FOLLOWING ISSUES OF 73 to complete my collection. March 1963 Dec. 1963, June 1966 July 1966. Lance Lee, 301-7th Ave. E., West Fargo, ND 58078.

RECEIVERS: RBA, RBB, RBC with power supply and cable. Also,

DERRICK ELECTRONICS will not be undersold on new Swan, Drake, Galaxy, Hy-Gain or Mosley equipment. Check around, then write, Box 457, Broken Arrow OK 74012.

MODEL 19 TELETYPE, good operating condition, for sale or trade. (202)-234-4678, P. S. Richter K1SDX/3, 2727 29th St. N.W., Washington DC 20008.

SELL: HQ215 for $295; Sencore FE16 with HV probe, new for $75. M. C. Smith, 614 Bradbury Rd., Monrovia CA 91016.

WANTED: Phono record or tape recording of Catholic High Mass sung in Latin, or information where to buy. Write: WA7NSO, 501 So. Ash St., Centralia, WA 98531.

MSI-DTL INTEGRATED CIRCUITS: Guaranteed new - gates 56¢, F6F 72¢, MSI $2, dual lamp drivers $1.60 — other inexpensive parts. Mitch-Lan Electronics Co., Dept. 7371, P.O. Box 4822, Panorama City CA 91402.

MOTOROLA 80D: 12 volt transceiver, crystal'd on 52.525 Mhz, easy to multi-freq; $60 or trade for Motorola 450 Mhz base. Ed Pores, WA2ZBV, 16 Dorchester Drive, Manhasset NY 11030.

"1971 TESTS-ANSWERS" for FCC First and Second Class License. -plus- "self-Study Ability Test." Proven! $9.95. Satisfaction guaranteed. Command, Box 26348-S, San Francisco CA 94126.

VHF-UHF COMMUNICATIONS RECEIVER, A.M., covers from 225 to 400 Mc. 750 discrete frequencies selected with external switch box. Design similar to ARC-27, but much smaller. Original government acquisition cost $18,350. Good for conversion or parts. Salvage value much more than my price of $25. Send for detailed information. Money back guarantee. Richard W. Solomon, 19 Pierce Road, Watertown MA 02172.

TECH MANUALS — R-390/URR, R-390A/URR, BC-639A, USM-24C,

HEATH SB 301, SB 401, $275. each or $525 both. Three 10' sections Rohn No. 25, $15 each. Ken, WB6BNU, 19400 Sorenson No. 131, Cupertino CA 95014.

UTAH AREA the size of Delaware and Rhode Island with 80 families served by independent telephone company needs career maintainer for entire system. Broad ham background useful. W7NVY or 702 359 0586.

THE 20th ANNIVERSARY DAYTON HAMVENTION will be held on April 24, 1971 at Wampler's Dayton Harra Arena. Technical sessions, exhibits, hidden transmitter hunt and an interesting program for the XYL. For information write Dayton Hamvention, Dept. 7, Box 44, Dayton OH 45401.

MAKE MILLIONS? Hundreds? Sell Instant Gourmet Kits (eight herbs and spices in beautiful red plush wallet) to local gift shops, stores. Dandy fift item for friends, businesses, travelers. Why be poor? List for $5, your cost $26 dozen. Instant Gourmet, Peterborough NH 03458.

WEST COAST HAMS buy their gear from Amrad Supply Inc. Send for flyer. 1025 Harrison St. Oakland, CA 94607. 451-7755 area code 415.

73 Lifetime Subscription

A LIFE subscription to 73 costs $73. By comparison with life subs to other magazines this is quite a bargain. With inflation going the way it is, and no hint of it stopping, plus the unending raises in postal rates, that $73 could be gobbled up in a very few short years. Early life subscribers to 73 have already saved the League should be the voice of all amateurs, but not disconnected from the brain of those amateurs. Wayne feels that the League should take complete responsibility to see that no legislation is passed that is detrimental to the will of those individuals represented by the League. And he has expressed many more such attitudes that make him rank high with amateurs in general.

So the thought occurred to me that if the League is failing so miserably in its duties, and Wayne Green can see these failures and pinpoint them, why not replace the general manager of the League with Wayne himself?

Fantastic, you say? Not really, if you think about it. For years, concerned amateurs have been writing Wayne, asking that he do something to help save amateur radio from its downward spiral. If he would accept an appointment by the League directors, this would provide the ideal means by which he could help. Instead of giving lip service to the duties of the League, he could get in there and make it happen.

There are 16 directors. If a quorum of them got together, they could fire John Huntoon and draft Wayne Green. As an active amateur, an experienced leader, and a concerned member of the League, Wayne Green would not refuse to serve.

I mentioned my thoughts to Wayne. The whole idea, he said, was almost incredible. Of course he'd serve, but the problems involved would be manifold. What about 73, for example?

Well, what indeed! 73 and QST could be combined. The problem would certainly not be insurmountable. When you get down to the nitty-gritty, you see that if as few as nine directors decided that Wayne Green could do more for amateur radio than John Huntoon, the switch could be made. . .that quick!

What do you think?

quencies are off a bit. The conventional tone frequencies in use for amateurs are 1650, 1800, 1950, 2100, 2250, 2400, 2550, 2700, and 2850 Hz. Before adopting any frequency, be sure to check the frequencies in use by other repeaters within your operating range.

Repeater Directory. The April issue will be spotlighting FM. Naturally, last year's repeater directory is out of date by now, so we'll be publishing a whole new one. We want it to be as accurate as possible, so if your repeater wasn't listed last time, send us the details *now!* Give us call sign, in/out frequencies, tone requirements, etc. Don't wait, because it will be another year before another directory can be published. This is positively your last chance to have your repeater listed. Don't put it off any longer.

New Books

Canadian Amateur Radio Regulations Handbook, published by the Canadian Amateur Radio Federation, P.O. Box 334, Toronto 550, Ontario, Canada. Price $2.55 postpaid.

Of special interest to amateurs in the U.S. is the section on non-resident amateur radio operators who are planning to visit Canada.

Certainly every Canadian amateur should get a copy of this complete guide to Canadian regulations. Despite the low price, this is a big fat book; a good buy on poundage alone. Canadians can be proud of the job that the CARF has done on this book.

HAPPY NEW YEAR

FROM ALL OF US AT 73

. . .K6MVH

Lance Lee, 301-7th Ave. E., West Fargo, ND 58078.

RECEIVERS: RBA, RBB, RBC with power supply and cable. Also, R-511ARC, 190-550kc, R-509ARC 108-135mc, SASE other items. Lisaius, 116 Orton Road, W. Caldwell NJ 07066

FOR SALE. Drake TR6 with AC4 Supply, $500. SX42, $50. John Ashton K8ISF, 737 Bryson St., Youngstown, OH 44502.

LAST CALL FOR 1963 73. Bound volumes of 1963, regularly $15, while they last only $7.50. Act now! 1963 was a very good year. 73 Magazine, Peterborough NH 03458.

JIG SAW PUZZLES WANTED. Lover of those wooden jig saw puzzles is looking for any that might be still around in your attic or closet. There used to be thousands and thousands of them, so there must be a few left. If you have some that you would like to find a good home for, write to Wayne Green, Peterborough's most avid jig saw fan, Peterborough NH 03458. State price, if any.

SELL: SB-301 with s.s.b and c.w. filters. Guaranteed in excellent condition and in A No. 1 working order. $225 or best offer. Norm Hanks 814-8662579.

Richard W. Solomon, 19 Pierce Road, Watertown MA 02172.

TECH MANUALS — R-390/URR, R-390A/URR, BC-639A, USM-24C, BC-348J, URM-25D, OS-8C/U, UPN-12, UPM-45, $6.50 each; IP-173/U, TS-323/UR, TS-175/U, $5.50 each. S. Consalvo, 4905 Roanne Drive, Washington DC 20021.

CLEGG ZEUS - CLEGG INTERCEPTOR. Very nice condition. Manuals, Spare Finals. Prepaid $449. Collectors items: NC81X — NC100 - Good. H. Snyder W0NVE, Route 3, Fremont NB 68025.

KNOW your frequency. Lampkin meters, 105B frequency, 111 PPM, 205B Modulation. $600. All or separate. K8ILR, RR No.1, Box 29-A, Suttons Bay, MI 49682.

FM 210 CRYSTALS: Receive 146.76 and 146.82. Transmit 146.22, 146.25 and 146.34. Guaranteed $5 each postpaid. W1EWC, 1 Clark Circle, Bedford MA 01730, 617-274-6488

FOR SALE: Eico 720 90w cw xmtr, Eico Modulator, Lafayette He-74 vfo and a Heath Hw-17 2m xcvr. Best offer only. J. Gawronsky, 72 Wilson Ave., Athol MA 01331.

SLOW-SCAN

by W2NSD/1

Ron, of EKY Video Vision (the EKY is from W2EKY), stopped up at the 73 HQ and demonstrated his new SSTV monitor unit. This is a complete monitor using his circuit boards and selling for $298 in complete ready-to-use form.

We watched a demonstration of pictures sent on 20m and were favorably impressed. While Ken and I do not quite share Ron's enthusiasm (he believes that SSTV will be as popular as SSB in a few years), we do think that it is bound to become popular, rivaling RTTY perhaps.

It takes eight seconds for each picture to come through, so it isn't exactly moving pictures. And by the time the bottom of the picture is being scanned the top of the picture is fairly well faded out, even with the long P7 phosphor of the scope tube. Still, if you shade the tube you can see the picture. It has about 120 lines as compared with 440 for commercial television, which reduces the definition somewhat (like about one-fourth) and the picture is made up of black and greens, with no shades of gray, which further reduces the definition.

The two main methods of sending the pictures are either through a regular television camera with one frame being used every eight seconds, or by a flying-spot scanner. The camera can send live pictures, albeit nonmoving. The scanner sends only photographs and drawings. The scanner has the advantage of being a lot less expensive to hook up.

could be gobbled up in a very few short years. Early life subscribers to 73 have already saved a bundle.

A few fellows write in worrying that they might not live long enough to make it worthwhile. Let's ignore the fact that a life subscription to 73 seems to be one of the best insurance policies yet devised . . .out of about 600 lifers we have had but one die. One in ten years!

73, as just about anyone who has visited our offices will testify, is a philanthropic enterprise. The top staffers here all could make far more money working at other jobs, but are devoting their life to the magazine because they feel that it is important. Your life subscription to 73 helps out. It helps us to be able to run more pages in the magazine. . .it helps us to be able to put a few more iron curtain hams on the gratis mailing list. . .and it tells us that you like our work and have confidence in us.

If you have a spare $73 around now, the chances are that you have provided for your family and that an extra ten or twenty dollars are not going to make much difference. You are gambling with the money, but even if you lose you win in the long run for your money will be well used. Can you ask much more than that?

When you reach the next world the important things will be those acts of good that you have done. A life subscription to 73 is not going to hurt one little bit when you are trying to balance out some of those rotten things you've done. Invest in the future, either way, with a life subscription to 73.

LETTERS

HOMEBREW FM RECEIVER

A number of hams in this area have been trying to design a multichannel, solid-state, 2 meter FM mobile receiver. We have expectantly watched 73 Magazine for construction plans, while burning out transistors and ICs in our own experiments. We recently purchased a number of surplus 10.7 MHz i-f strips and would hope to utilize them if possible. Any consideration given by you or your staff to this problem would be greatly appreciated.

Don WA0YFI,
59 Morningside, St. Paul MN

We have several receiver articles currently "in edit," one of which is an extremely sensitive and stable unit that is microminuature.

HOT TIP

Having trouble burning the cord on your soldering iron by brushing it with the hot iron tip? Wrap the cord with Scotch number 27 glass tape; this tape is also good insulation for cords in places where the wire may be exposed to heat.

Orville W5PGG
1435 King Clarksdale MS

Charlie (photo) is presently active on all bands from Yaounde, Cameroun, West Africa. He is from Briston, Tenn., where he signs K4PHY. He has also operated as DL5IX and K4PHY/YV5. He plans to be active from Yaounde for at least two more years.

Les K42CP (TJ1AW QSL Mgr),
Box 626, Hickory NC2860l

The only hope of those against incentive licensing is to support Wayne Green and 73. Mr. Green is cognizant of what this unpopular regulation has created for the amateur and he is making an honest conscientious effort to change it. My immediate concern is not with his earlier affiliations or proposals but what he is doing now. He has a horrendous task of bucking a million-dollar combine such as the ARRL but his determination and tenacious fortitude should make him a formidable and respected opponents. With the radio amateurs' support I believe him capable of bringing about beneficial changes to the radio amateur service in spite of the ARRL's irresponsible do-nothing attitude. **Harry W2SAD,**
196 Madison, Mt. Holly NJ

Now let's get down to brass tacks. "Why don't you get yourself nominated? (it can be done) and run in the fall ARRL elections."

I think you have an excellent magazine —,especially with its many technical articles. but the constant arguments with ARRL I don't believe is helping much. Maybe you'd make a good balance on the board. Then maybe you can do something, but just the constant hammering with words hasn't done much good.If you can't get nominated over in the East come on out and run in our district.

Your staff has certainly written the most qualified series on obtaining higher license. I am certain I (totally disabled) would never have obtained my Advanced class license without the study series. I learned even more than was necessary to get the ticket. I am a member of ARRL because I believe I can have more effect in than out. Come on Wayne — more action will help quench the sarcastic officials at ARRL.

Hank WA7JAQ
1324 W. Knox, Tucson AZ

Australia has a ham dropout problem too,& again I regret to say that SSB is the problem. The young ham works locals on 40 and 80 meter AM phone, and wants to work DX. He can't. Not on AM anyway. He can do it on CW, but many of them don't. And you have to have SSB on 20m. So, the young VK ham as 3 choices. He can spend at least 10 weeks' wages & buy an SSB rig. He can build an SSB rig. He can forget the whole idea. Some buy gear. One or two build SSB rigs; the rest just fade away. The young hams with financial problems quit.

SSB is progress, and we must have progress to survive. Illegal CB DX on AM is a problem here, as it is in the USA. As long as it is the only DX you can work on AM phone, it will continue to be a problem. Maybe we should force CB into SBB; one in — all in! We have the problems; does anyone have the answers?

John Smith VK31Q.Victoria,Aus
Victoria, Australia

Here at work three of us get different U.S. magazines which we then swap around. In the latest 73 to arrive there appeared an article "What's happened to Hamdom". My congrats to the author as he appears one of the few ready to speak up in favor of QRP. As an outsider may I comment that the answer appears to be in educating the newcomers, the Novices, & anyone who will listen that high power is not necesarry.

Educate them to join the QRP ARC (and I am not a member) whose members will not tolerate more than 100W input (CW) and 200W PEP. They believe, too, in homebrewing their gear & then dragging every erg possible out.

I have never used more than 65W but it has scored me 187 countries! OK, so we don't have the numbers that the U.S. has to content with but finding a blank spot in the spectrum is just as detect radiation by radar, ultrasonics, magnetics, etc. There are echoes to the effect that even kings and queens are interested in UFOs.

R. Hervey,
50 Croftend, Glasgow, Scotland

Our ham national league is having some big trouble now, and this has been taking all my available spare time for the last few weeks. (We have a local Huntoon, I'm afraid).

Anyway, I hope to have an article soon with an interview with one of our telecommunications authorities.

Flavio PY1CK, Rio de Janeiro

ARTICLES

Your article, "A Low-cost RF Wattmeter" on Page 72 (Nov. 1970 issue) at the top of second column after the word assume, should be "4W is full-scale meter indication in watts". I changed "reading" to "indication" because meters do not read; people do.

W.H.G.,Box 24, Richlands VA

You'd better change it back; Webster and I agree that "reading" is a noun that means "data indicated by an instrument."

. . . Ken

Though 73 is an amateur radio magazine that normally costs a dollar a month it is vastly superior to anything offered by its British counterparts even though these are somewhat cheaper. The broad exchange of ideas and ample technical material coupled with the relaxed style so typically American is very good value. I am even doing some restudying by following your study series.

B.G.E.,G3RJX,213 Perry Wood,
Great Barr,Birmingham

I simply could not believe the mistake made by K1CLL on page 36 in the Nov. issue! This is a classical error; when you use one-half a centertapped transformer winding you do *not* obtain one-half the impedance! In his article he uses half of a 125 that has existed in our hobby for too long — a lack of communication!!

Keep on printing all those letters to the editor. Especially like the idea of printing the writer's mailing address — how many times I've seen letters and thought "Boy, I'd like to tell that guy a thing or two."

The Amateur Radio News Page is good. General magazine layout is improved also; but why not group all the ads together in one part of the magazine?? Think most hams read the ads as well as the articles, in some cases more so. Would make it easier when I wish to refer back to an ad if I didn't have to page through the whole magazine — the Ad Index helps here but I can't always remember the advertiser's name, sometimes just a particular product I want, which may have little relation to the advertiser's name. Your gang is doing a good job.

Larry W7FOQ,
Box 345, Moro OR

Your editorials and comments by your other writers are great. I want to write a long letter but don't seem to get the time. I do feel that a registered lobbyist in Wash. D.C. is important. I agree completely with the comments re CB made last month by the K2 on your staff.

Howard Furst,
Box 246m El Toro CA

I've built almost everything K2TKN or K1CLL have ever written about. The 6 and 2 linear (page 8, April, 1966) is the easiest thing I've ever built, and it's one of the best articles on VHF construction I've ever seen — clear, simple, concise — that's the way Bill Hoisington wrote it, I'm sure. This amplifier, incidentally, works like a charm, and I've built a few for friends without workshops.

Steve WB2WIK

Being about a year behind in my reading, it was only today I read "Light Naturally Runs

SCOPE STAND

Maybe your suggested approach is right. See "Mr. Virgo

hard whether you're using a KW or a couple of rusty nails.

Most countries of the world

ohm winding and says that the impedance obtained is 62.5 ohms. Not so! The correct value

Down" by K1CLL. Really interesting! Can you run some more

SCOPE STAND

Here's a picture of an oscilloscope stand that I find practical. It's the skeleton of a high chair that I bought from the "GoodWill" for 75¢. My modifications are the side pieces and the angle across the back. I'm sure that others will have better ideas for alterations.

I also have bought surplus grocery store racks at the GoodWill to put signal generator & other equipment on, to leave the bench clear for my projects. Just takes patient shopping to find something that the equipment will fit into, and be at the right height.

John W7SCU,
1944 8th Ave,Seattle WA

A NEW LEAGUE

Great going on the license info. When is Wayne going to volunteer to start a new ARRL? Want a donation? I'll pledge a fair sum if he'll tackle the job.

Scott WB6USM

We need a new organization to support our hobby? I personnaly had been thinking along this line for several months; unfortunately, I'm one of the silent majority. I, for one, would be most happy to see a new organization developed.

Also having seen 73 grow from that small underdog to the present day monthly informative, I am convinced that you have the management and intelligence to successfully do the organizing and developing. Needless to say I would probably break my neck trying to get my application in to become the first official member. As for raising the enormous amount of money to finance all of this, well, I'll have to leave that to your fine team or some other ham with a lucrative scheme. How about it, men? Wouldn't your morale be higher if you belonged to a club and could be centrally united to better our great hobby in this universe?

Glenn R. Snow WB9DBC/9
Box 112 Camp Douglas WI

Maybe your suggested approach is right. See "Mr. Virgo Himself" editorial on News Pages, this issue.

. . . Ken

ARRL is basically a good and highly useful service and amateur organization. It has a tremendous potential which seems to be lying dormant. If all of the hams who wanted to *improve* ARRL would get together by letters and at election times, we could be represented and make it an organization with a real "fraternity" attitude from all its members. Maybe I'm too naive. If this is so, I'm willing to work for forming a new club, but one big voice in FCC's ear would be better than one small one.

Jim WA0KYM,Leavenworth KS

FROM AROUND THE WORLD

It is now about 10:30 p.m. here, and all I hear is QRM on 20m. It is cold outside altho today was warm; almost "shirt-sleeve" weather with 18 in. snow that fell Friday while we were here.

There are many here — HB0XKZ, KQ, SF, etc. HB0XSF is DL4WJ (John Wilson) — we drove up in my VW wagon. He is operating in a cabin and I am fully set up *in* my wagon as you see in the photo. I have TR4, Hustler antennas, heater, stove, food, etc., and sleeping bag. I sit here in back and operate all day & night with ac power from the house.

We are about 5000' here just above the town of Triesenberg and below the Hotel Graflei. HB0XKQ is above us at the Graflei about 1000' higher. HB0XKZ is below us in the town.

The trip is about a 6 hour drive for me. I live in Zweibrucken, Germany, as *DL4VA* and am a civil servant. Home is WA4WME in Huntsville, Alabama. HB0 is not rare any more as many Ds and HB9s come here all the time.

Hugh Vandegrift F0UG

hard whether you're using a KW or a couple of rusty nails.

Most countries of the world use 200W or less & this seems to rock the 4W kids whose reports frequently aren't much better than the QRP station he is working.

GO LOW & have fun. Get the newcomers interested & warn them off QRO & let's get hamdom back into better shape.

Barry Clarke VK5BS,
South Australia

For the information of U.S. DX'ers, Europeans are limited mostly to about 15W dc input. Be a sport and use your cherished linear only if necessary. Consider it this way. When you need it, you have it. And that is a nice feeling. But only use it in extreme cases. Give the other amateurs a chance, and lose the face of the "Ugly American" again.

I was last year working PA0WEJ from a Swedish ship in the Caribbean. I had my wife aboard, and the transceiver functioned more as a social link than a DX gun. So often I was calling "the European station with the weak signal please come again, the other stations please sit by." The "Ugly Americans" came back straightaway, 40 dB over 9. Plenty of them. It is difficult in these circumstances to maintain politeness. This happened so often that I winded up by calling "please, only Europe stations, no American stations." This is what American hams are doing! In Europe they have a saying which goes like this: "The one who fits the shoe, puts it on." Although it loses much in translation, the meaning is probably QSI'd by most of you. I would be pleased if 73 would print this as an opinion of a Dutch, but morely a European haim. n.

W. deVries PA0WEJ

I'd be interested to know about apparatus used by UFO experts in the U.S. How do you

ohm winding and says that the impedance obtained is 62.5 ohms. Not so! The correct value is 31.25 ohms (one-quarter of the total impedance). *Please* print something about this. I wish I had a dime for every time I have seen this error — I would be a rich man!

Clyde Wade, 312 S. Cedar, Little Rock AR.

Back in 1966 when I finally decided to subscribe to a ham magazine, I bought a copy each of QST, CQ, and 73 to see what was best. I have been receiving a copy of 73 every month since then — even though my ticket has lapsed — because of the technical articles on the pages and the light-hearted attitude between the pages. Now how about a "here's how I did it" column? Few of us are qualified to write a full-length magazine piece. Yet we all have some good ideas to share on how to proceed with a specific operation or a brainstorm insight which works well for us. Even if the column never comes to be, orchids, roses, and welwitcha blossoms to the magazine and the dedicated group which puts it in my mailbox each month.

Charles, 7918 Lamon, Skokie IL

Looks like your Printer's Devil has been exorcised in the current 73 — I coldn't find a single transposed line, misspelling, or error of any kind. Tight editing for which many of you will share the credit. Nice going!

Jake WB2PAP, Stewart AFB,NY

We're verry carfull about such things.

EDITORIALS

More W2NSD, K6MVH, K2AGZ. More W7ZC, K1YSD and any others that will stimulate people to think. By presenting these writers and their differing opinions you are going a long way toward filling a void

Down" by K1CLL. Really interesting! Can you run some more like this? If you do, please use some sort of eye-catching device — so I read it right away!

John WA2LJK

How about us printing a personal note to you on the front cover?

FREE SPEECH

The "free speech" controversy brings to mind an incident of several years ago. I lived in a small town, and we had (don't most small towns?) a swimming hole. We got a new minister in our church who was young enough to enjoy life with young people. One day he and I went swimming, and were recognized some distance away by the local tough guy. As we approached, we heard some of the most vile talk imaginable. We came within speaking distance and Mr. T. G. said "I didn't recognize you, Reverend, or I would have been more careful." I never will forget the answer. "You talk any way you want, but I don't have to answer you that way." The next Sunday Mr. T. G. started a habit of church attendance, and his everyday language improved.

I think we should all be guided by our knowledge of what is socially acceptable.

Lester WB4HPB,

Box 5153, Birmingham AL

Even though I am a 16 yr. old, 6-month Novice, I am also an activist. I concede that I was late in sending the coupons (they're great), but I finally took the time tonight to mail them all. The sudden reason was an attempt to get on 40 meters which became so sickening I gave up. I hope I'm not too late.

I think your editorials and news pages are fantastic, especially Ken's in the Nov. '70 and also George's (W4PZS) on the League, etc. It also helped me to decide to write this letter. I don't like the 220 MHz idea at all. Can't win 'em all.

Paul WN1MPY

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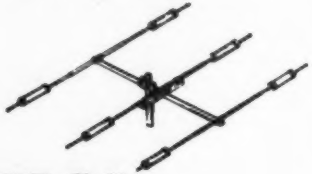

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Designed to provide the extra gain for working hard-to-reach DX. Incorporates the exclusive Mosley patented "Balanced Capacitive Matching". Features include six Trap-Master traps with resonant frequency stability, improved boom for even wider element spacing. Stainless Steel hardware. Fits up to 2" mast. Use with most heavy duty rotors. The CL-33 is designed for 1000 watts AM/CW or 2000 watts P.E.P. SSB.

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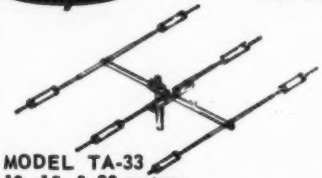

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New Six-Band

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watts P.E.P. SSB.

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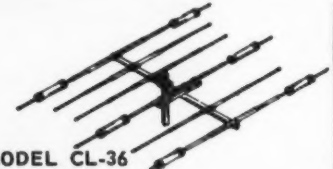

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The Classic 36, incorporating the Mosley superior feed system 'Balanced Capacitive Matching'. This wide-spaced, six-element beam employs 4 operating elements on 10 meters, 3 operating elements on 15 meters and 3 operating elements on 20 meters. Automatic bandswitching is accomplished through Mosley designed high impedance paralleled resonant "Trap-Circuits".

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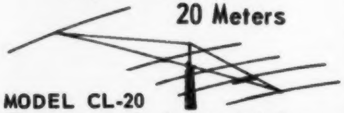

MODEL CL-20

The improved electrical balance, "Balanced Capacitive Matching," combines with optimum spacing to provide maximum gain, increased bandwidth for greater efficiency in performance.

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Designed for full power, the new Classic 203 will out-perform many four to six element arrays. The Classic Feed System, combined with optimum spacing to provide maximum gain, increased bandwidth and rugged construction, offers the most in 3-element, 20 meter beam performance.

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A unique mobile antenna system offering the greatest number of money-saving options ever available in the amateur radio market. Your choice of 6, 10, 15, 20, 40, and 75/80 meters. Select from five new interchangeable coils, all of which are especially designed for the thrifty, economy-minded Ham.

Each "Rode-Master" coil is precision wound on phenolic form, housed and sealed in a durable, water-proof phenolic case and power rated for 200 watts AM; 400 watts P.E.P. SSB. VSWR 1.5/1 or better at resonance on each band.

The upper whip section of the "Rode-Master" Support-Mast is a Six-meter antenna, adjustable for the entire 6 meter band and may be purchased separately.

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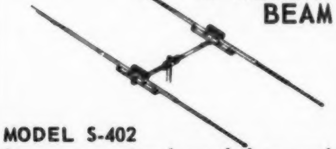
"RODE-MASTER"	Models
6 meter antenna	MD-6
10 meter coil	MD-10
15 meter coil	MD-15
20 meter coil	MD-20
40 meter coil	MD-40
75/80 meter coil	MD-78
Matching Network	MD-48

Signal·Master
40 METERS BEAM



MODEL S-402

For a top signal needed to push through 40 meter QRM, the Mosley Signal Master S-402 will do the trick! This 100% rust-proof 2-element beauty constructed of rugged heavy-wall aluminum is designed and engineered to provide the performance you need for both DX hunting and relaxing in a QRM free rag-chewing session. Beam is fed through coupling, resulting in an excellent match over the entire bandwidth.

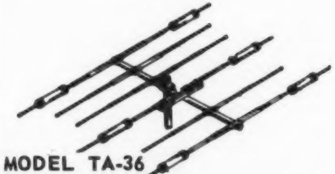
TRAP MASTER Multi - Band Verticals

MODEL RV-3C

Three band vertical for 10, 15, and 20 meters. RV-3C features automatic bandswitching and low angle radiation. Complete with guy line, "Cycolac" base, coax fitting and all necessary hardware.

MODEL RV-4C

Mosley RV-4C, vertical antenna is ideal for installation where space is an important factor. Designed for 10, 15, 20, and 40 meters. With automatic bandswitching. Entirely self-supporting.



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VIETNAM

On behalf of the entire Army Mars Station, AB8AQ located in I Corps Vietnam, I would like to thank you for sending us your publication. Being in the northern section of the country we seem to get very few magazines or newspapers, and are always grateful for any periodicals we get. But working in the Mars Station and being a former ham myself, it is particularly enjoyable to receive your magazine. Mr. Alex Scherer, W9EU and A9EU, wrote us and reported that you had sent us the issues. And we do want to thank you for them.

All of would far prefer to be home, and in less than a year we will be. But while anyone is so far away from home it is always a comfort to know that someone back in the States is going out of their way to make our time spent here a little more pleasant. Once again we say thank you.

AB8AQ 8th RRFS
APO S.F.96308

Our station received your 73 Magazine yesterday. We would like to thank you for thinking of us GIs over here in Vietnam. We will be looking forward for the November 73 Magazine along with QST. The magazine will be a great help to us over here in trying to get our general ticket, so when we get back to the States we have a better understanding of basic radio theory. Most of the personnel in our station are trying for our general ticket, so 73 Magazine along with QST will help us toward our goal of being in league with the hams all over the world.

Tony, Mac, and Petty AB8AAV

We got your copy of 73 and we enjoy it much. I find it as helpful here as I did when I got it at home. We all want to thank you much for the copies. Also for the great work you are doing for us over here. My greetings come from not only us here on the station but from all U.S. servicemen here in Vietnam.

Larry AB8AAS

I do not think the 220 band should be used as a refuge for CBers. We all know how the well-intended CB program exploded in complete chaos. I would hate to see the ham bands exploited in the same way. Also, this thing could start a trend which would eventually result in a merger between amateur and Citizens Radio. CB was never intended to be used for what it is being used for today but nevertheless, it is being used for a "ham" band for persons who are too lazy to study and become a legal ham. In our society there are certain individuals whose aims are to corrupt or destroy whatever they can, to see how much they can distort something. We find a large percentage of the CB population are these type of people. Have you listened to the CB band lately? What do you hear? I hear pseudonyms instead of call signs, operators boasting about the performance of linears. Do you think these individuals will reform and become decent members of the amateur fraternity? Will they give up that linear to become a "hobby ham" or will they carry their present ways into the ham bands? Will we see the 220 band evolve into what the 11m band is today? If it does, perhaps we could give them part of 40 or 80m. In my opinion, such an idea would only attract the somewhat undersirable portion of the CB population, not the legal users. The CBer who uses his rig for business or personal use will stay on the CB band. Why invite trouble into the ham bands? Why chance earning the same reputation that the CB band has after spending years building the one we have? Another point, would the band be self-policing? If so, why isn't the CB band self-policing? Why would a CBer who is using the CB band illegally suddenly become conscious of the existence of the rules? Concerning the proposed test, I think that any individual who is seriously interested in radio as a hobby should be able to pass the General exam. If he is going to use vfo's and experiment with equip-

Your comments recently in 73 about the general public not knowing the difference between CB and ham operators sure hit home with me. I have found so many times that the public has no idea of the difference. Even my wife didn't know the difference until after we were married!

Cal W9ZTK, Mendota IL

I also sincerely doubt that the present "better ops" on 11m would move to 220 MHz. The decreased range from base to mobile would discourage most of them from making such a move. Our 6m band has been self-policing to a large extent but let's not be giving the CB'ers credit for this as this is a ham band. I seem to get the idea that we should move all the "good guys" to 220 and let the present chaos continue on 11. What assurance do we have that only the "good guys" will move to 220 and who is going to determine whether he is a "good guy" or a "bad guy"? With the present growth of CB'ers it seems to me that for every one that moved to 220 he would be quickly replaced on 11m.

Bob WA0PVM
5544 Blue Ridge, Raytown MO

I've been thinking about this ever since I read of your proposal of the "Hobby" band. I think this should be revised. Many people would still use 11m for DX. The best way to alleviate this problem is to push for the removal of the CB band from 27 MHz and move it to 220 MHz. Then take the hobbyists and put them on 27 MHz. Amateurs could use this band also as a police force and also to help convert these hobbyists to ham radio.

Rick Brown WN0ZQX

I would be grateful if you would print that an SB-33 was stolen from my car on Oct. 17. Identifying features are: serial number 103327; meter face is illuminated by a square of light that lights up only the center portion of the meter scale; also an electrolytic in the power supply is held in place with a

the additional requirements you suggest. With the majority of us "pirates" it's not the money, but the pleasure of hamming; we are prepared to pay for reliable equipment.

J.C., Melbourne, Australia

The Hobby idea is outstanding. Something must be done about the conditions we are now putting up with on the 27 MHz band and this is one way to do it honorably. It might seem to be hams that this is the easy way out for the FCC but doing it this way a lot of "Good C Beas" won't get put out of business for the actions of the skip-talking crowd now on 27 MHz. Many have great interest in radio but are afraid to tackle the chore of being a ham because they hear it is hard to pass the test and that the gear is expensive. Allowing this type of individual to take advantage of the proposal made by FCC he would be broken into radio the right way instead of being suckered into the mess on 11m. Once on the band and with no fear of the FCC the operator can relax and enjoy himself, he can maybe even join the local ham clubs and be able to see the true picture of full advantage of upgrading to higher class license.

David McCallum,
Box 193, APO S.F.

I am in support of the Hobby class license — especially the frequencies involved. I would hate to lose it like we did 11m. I hope that maybe we can get the ARRL to support it in which more attention would be given by the FCC.

Darwin WA0HEY',
Box 160, Belmond IA

I have been thinking about RM-1633 and the more I think about it the better I like it. One thing I have wanted to do in the past is talk home to my wife while driving home from work. Like most women, she is not interested in learning code or electronics, so there is not much hope that she will ever get a regular ham license. The Hobby license would be just the thing. I

1011 fiasco among other things. He and I know the thinking behind its introduction.

Too bad you fellows up in the Northeast don't get the word! Or are you pressed for something constructive for your column?

Do us serious hams a favor, will you? Hold the B.S. down to one page so there'll be more room for tech articles.

John Conley W7ZFB

Okay, John, We've got it down to one page now. But you might need a magnifier. How about a foldout next month? hmmm. . .
. . . Ken

I have a Collins KWM-2 transceiver which will operate on the 11 meter band without modification. What's so unusual about the Swan?

Bob WA4NXC,
949 1st St., Albermarle NC

The Swan editorial is surely misplaced. It either belongs in the April Fool issue or in the CB magazine. No intelligent amateur would either write or believe in what you had to say. The name calling you did reminds me of what K6BX had to say to Kennedy Space Center ARS a while back. So I will put K6MVH in the same category as most have done that lunatic from California, even though I had previously thought he was well known and liked in FM circles. Concerning the Swan 1011: What amateur in his right mind would spend that much money on a rig that works only on a band that will be dead soon? The last time 10 'went dead' they even made rigs without 10m capability. What amateur in his right mind wants to listen 30 minutes to a guy with call letters "Mickey Mouse" to find out how far away he is, so that he can go operate on 10m? Let's face it, there is more money in the illegal CB market than in the amateur market and Swan wanted to take advantage of it. I bet you don't write in your CB magazine that only one in two hundred CB'ers has the knowhow to modify the 1011.

the station but from all U.S. servicemen here in Vietnam.

Larry AB8AAS

individual who is seriously interested in radio as a hobby should be able to pass the General

that lights up only the center portion of the meter scale; also

electronics, so there is not much hope that she will ever get a

of it. I bet you don't write in your CB magazine that only one

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HOBBY LICENSE

I am a college student in the bay area and have listened to the progressive degeneration of CB over the last year. The channels are jammed with assorted heterodynes, carriers, snickers, giggles, linears, skip from the east, "news reports" by right, left, and otherwise radical groups, and Part 15 communications, obscenity, and almost anything imaginable. The exchange of operating specs between two stations seems lily white compared to the flood of misuse. I was considering going on the band, but cannot in good conscience add my signal to the witches' brew. It would be useless and self-defeating. The Hobby band proposal is heroic, I feel, and I offer my support to whatever supporting efforts are needed for the proposal's passage. If the fertile area of VHF can drain off the serious CB hobbyists, the band could be left to the FCC and the nuts, then to legitimate uses once the deadwood has been cleared out. It is true that some CB hobbyists go on to Novice; others, like myself, are totally disinterested in code and resent the inroads into phone requirements. SSB has closed the CW AM DX disparity, and I think that an interest in radio construction and propagation should be the only requirement for ham licensing. Naturally, I do not want to force CW out of amateur radio, but I think that the 220 band can be used for strictly hobby, with a rules and even a theory test, possibly as hard as the General theory exam. The world of VHF is exciting, as exemplified by the DXpedition recounted in QST where new records were established on 1000 MHz (okay, so it is UHF, it's still exciting.) I hope others feeling similarly will write the FCC as I have done to encourage the proposal.

Mike Robison
504 E. Hilldsdale, San Mateo CA

exam. If he is going to use vfo's and experiment with equipment, he should be able to demonstrate that he possesses the necessary fundamental knowledge of basic electronics.

Ron WA9YUJ,
Box 71, Albany IL

Re the proposal for a Hobby license for the 220 MHz band, the idea of phone only was quite natural considering your pronounced prejudice against CW. Your desire to increase the activity on 220 MHZ is a laudable one. I had been toying with a similar idea for the last two or three years. It was prompted by the almost complete lack of activity on the 220 band in this part of the world. My suggestion was to open the whole 220 band to anyone with a special class license. No phone would be permitted, but these new hams could start by sending code to contact other people. Instead of practicing at home on a key and copying meaningless code, which becomes a chore and a task, have beginners practice code by actually sending to one another or to a legitimate ham. The equipment would have to be certified by the FCC, so that commercial equipment would generally have to be used. It would be crystal-controlled. It would be installed and checked out by a qualified Extra-class radio amateur. The idea behind the whole thing would be to create interest in code by actually communicating, populating the band, and yet have quality transmission. But only CW! The phone portion of the transmitter would be disabled and sealed. I think 220 band would be the ideal band for a learner.

Joe W8FAZ,
1227 Addison, Cleveland OH

73's recent proposal for a no-code license for 220 left me cold, so I must do the same for you as regards renewal. This is the first ham magazine I have dropped, so you can see how I feel about the 220 proposal.

Dick W9QWT

an electrolytic in the power supply is held in place with a piece of blue nylon monofilament fish line. If located, please contact me at 617-527-1346, or Newton Police (617-244-1212).

Eric K1NUN,
41 Prentiss Rd, Newton Ctr MA

Sorry, we don't print that kind of info.

I am a "pirate" and if you haven't already thrown this letter in the wastebasket I would be obliged if you would accept my congratulations for Wayne's practical proposal on page 10 of the July 73 regarding Hobby licensing. Typically, I suspect, I am a family man in my early 40s with a few dollars to spare but with a limited knowledge of radio, therefore "CB" (?) is the only way to have a go. Station procedure is relatively simple but the theory and practical takes time, especially if you haven't had any past experience with electronics. Frankly, I don't enjoy being a "pirate" and I am certain that my many friends don't either. With a Hobby license we could buy decent commercial rigs, and proudly erect that dream antenna instead of operating our clandestine stations with small portables and makeshift whips. Legalizing would sort out the genuine operators from the frivolous lads. Unfortunately, in Australia the only "CB" channel available is 27.240 MHz with a 1 watt maximum, so you can imagine the mess. Instead of your 220 MHz amateur band we have a 420-450 MHz band, however few of our amateurs use it. Surely we could use FM equipment on part of our 420 MHz band in the same basic manner as Wayne has proposed. In my business I run a licensed VHF-FM station with mobiles and all that is basically required to go on the air is the rig and the license fee. It seems reasonable therefore to propose a similar procedure here for Hobby Class licensing with, of course, regular ham license. The Hobby license would be just the thing. I hope RM-1633 is adopted because it will allow hams to do this type of thing (which now can be done only with CB). RM-1633 will increase the versatility of ham radio.

Roy W5PAG,
4748 DeBeers, El Paso TX

SWAN SONG

I just finished reading "Mr. Virgo Himself" editorial in November issue. I can't say that I agree with you when you said that we should feel ashamed of ourselves. It seems to me that a company the size of Swan would do at least a little market research before spending a lot of money on a project such as the 1011. I think that we are not as guilty of a shameful act as Swan is of making a mistake. The fact that Swan discontinued the 1011 is worthy of attention in that "ham opinion" was taken into consideration. If "ham opinion" is blamed for the discontinuance of the Swan 1011, perhaps we could use our pens to help bring the cost of the tools of our hobby down to a level where that cost is not a major stumbling block to would-be amateurs. Right now we are trying to get more youngsters interested in ham radio. When they look at the cost of new equipment, the impression is that ours is a really expensive hobby. This stops a lot of them cold, or worse yet, turns them to CB where equipment is traded more often and is available at lower cost.

Bob WA8IMO,
230 Moore, Avon Lake OH

I seldom write letters since I'm primarily interested in tech articles and the rest be damned, but when I read the (Swan) garbage, I just had to drop you a line. That had me rolling on the floor, clutching my sides. I'm giggling as I write this.

By the way, had a nice QSO with a Swan employee couple of weeks ago. We discussed the in two hundred CB'ers has the knowhow to modify the 1011. The ad said that the transmit function was simply left out of the relay switching circuits, the rest of the electronics is already built in for the CB mod. I agree often with your magazine's criticism of the ARRL and believe you recently mentioned their deaf ear or something to that effect. Your filing of comments concerning the 1011 in the wastebasket is typical of ARRL nonobjective thinking. I sincerely hope that I have made my point; I don't often waste time writing nasty letters and I'd rather spend it reading the many excellent articles in 73.

Ambrose W4GHV
538 E. Sanford, Auburn AL

May I offer a mild objection to your editorial in November 73, which concerned the pressure on Swan to discontinue production of the 1011 transceiver? You say the CB'er could not modify the 1011 for transmit use on 11m. They wouldn't have to! Amateur Electronic Supply of Milwaukee, Wis. already has the unit listed in their catalog, "modified by AES to transmit on 11m for use outside of U.S." I see the same relation here as selling illegal drugs. It's like saying "let me sell you this dope, but it's illegal to take." I believe one of the things a ham has had to be proud of is the custom of doing police work on his own bands. I think this is what has been done in the Swan 1011 case. I do not believe this was the intention of Swan. I have a Swan rig and can vouch for very fair dealings from these people. However, they have in the 1011 a ready-made (minus a few "special modifications") illegal CB rig to be added to the already too-long list being promoted by money-hungry dealers.

Gene WA5ETK,
Box 381, Texico NM

(More letters: p. 108)

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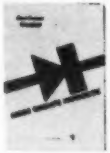

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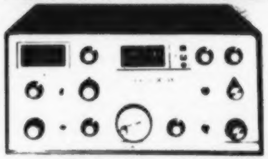

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If you would like a leisurely vacation with a bit of amusing radio operation thrown in, you might consider Luxembourg.

The Grand Duchy of Luxembourg is a small country right in the middle of Western Europe. It has frontiers with Belgium, Germany, and France. It is an independent country but maintains a currency union with Belgium, which means that 1 Belgian franc equals 1 Luxembourg franc, and both Belgian and Luxembourg currency circulate freely in Luxembourg. Note, however, that the reverse is not true. Luxembourg francs are not so readily acceptable in Belgium, so visitors are recommended to change their Luxembourg francs into Belgian francs before leaving Luxembourg.

The country is also part of the Benelux Customs Union.

For so small a country it is quite surprising what a large variety of different types of scenery, of ways of life and even of activity, it represents.

The country is far from flat. While it is not mountainous in an alpine sense, it is very hilly and has many beautiful valleys and rivers, as well as the high plateau.

Its activities vary largely.

In the southwest is the large modern steel industry. (Luxembourg is the center of the European Coal & Steel Community). The capital city celebrated its millenium a few years ago, from which it will be clear it is a very ancient city with architecture and ruins covering many centuries. Perhaps the most remarkable feature is the very deep valley of the Alzette which divides the city into two parts, with steep cliffs overlooking the valley and where many of the medieval fortifications were built.

Further north the country varies from agricultural land to the large artificial lakes created by various dams on the rivers.

The main roads are good and fast. The minor roads are good and slow. Here is some of the most delightful leisurely motoring one could wish for with the well surfaced but narrow roads winding up such lovely valleys as the Mullertal along the Entz-Noire river in what is called Luxembourg Switzerland, the Sure Valley, the Moselle Valley (don't forget the wines).

The valleys often end in steep climbs on to a high plateau with magnificent views for miles in all directions.

The food is good and abundant. Both French and German wines are available – try the Luxembourg wines grown along that stretch of the Moselle which flows in Luxembourg.

So far this reads like a travel agent's pamphlet. What has this to do with amateur radio? Plenty.

Luxembourg grants reciprocal licensing to the USA, Britain, France, Belgium, Holland, Germany, and through the "G" license to most members of the British commonwealth, as well as other countries.

Though Luxembourg is not a "rare" country by real DX standards, it is sufficiently uncommon for the LX call to be much more sought after than a W or a G, or an F or a DL call.

The varied type of country provides quite fascinating differences in propagation. From the high plateaux excellent mobile operation can be obtained to the whole world. WAC mobile could be worked in a day! Descending into one of the valleys while in QSO you may lose your contact completely, or in another valley find you are still in contact! Portable operation from the many country hotels is good fun too.

My first portable operation took place at the Hotel Hames at Boulaide in Western Luxembourg. This is a small unpretentious hotel whose proprietor was most cooperative in every way, even accompanying me to a farmhouse next door to obtain permission to put the trap dipole on the farmhouse roof. One of our first QSOs was with New Zealand. He also helped arrange for my battery charger to be connected to the hotel supply to charge the mobile batteries overnight. (But bring your own charger.)

LX1SX at the Boy Scout Jamboree station LX1JΛT at Ettelbruck.

Our good friend ON4PG came over from Arlon to visit us and help with the antennas.

From there we decided to try a different location in Eastern Luxembourg where at Berdorf the Parc Hotel was also most cooperative and other antennas were

LX1SL operating at Niederanven near Luxembourg airport.

LX1SI of moonbounce fame at his station at Luxembourg airport.

erected, including a mobile whip out of the hotel window working first against a quarter-wave of wire, and then against the lead roof of the hotel. Japan was worked by both methods.

It was on this occasion that my good friend ON4PG was killed in a motor accident. But not, as some rumors had it, while he was operating mobile. He did not even have a rig in the car when the accident happened.

In 1968 we went later in the year – in October. We were lucky, both with the weather and the DX conditions. We went to Beaufort in Eastern Luxembourg where the Hotel Meyer allowed us to put up three antennas: a trap dipole, a Cushcraft Ham Stik Dipole for 15 meters, and a Mini Products coaxial vertical dipole for 10, 15, and 20 meters (6 meters is not allowed in Luxembourg).

The results were most interesting. We worked into VK, ZL, and JA most mornings and the States and South America mornings and evenings. Although the hotel had a forest of TV antennas and was receiving programs from Germany, Belgium, and other places, no TVI complaints were received.

So far only HF and LF communications have been discussed, but Luxembourg is excellent country for VHF activity. Remember LX1SI who made a moonbounce QSO with KP4 on ¾ meters? Here is an advanced and sophisticated amateur who is really knowledgeable on all matters of VHF. Having made his ¾ meter EME contact, he had already dismantled the rig and the antenna, preparing for better things, so I could not photograph this. He is now working meteor scatter on SSB, and has probably made the first meteor scatter SSB QSO in Europe – one with Hungary and one with SV1AB. His shack is impressive but his knowledge and understanding are far more impressive.

Nor should we forget his brother-in-law LX1DC, who put Luxembourg on the map many years ago on AM soon after World War II.

Then there is the charming gentleman who runs the PTT and administers the reciprocal licensing, LX1JW, well known at the ITU and IARU meetings.

Besides the older and more experienced amateurs there is a crop of young enthusiasts coming along. I met two amateurs who had been licensed less than a year.

Both were on SSB – LX1SL at Niederanven (whose photo appears here) and LX1SK, who is a teacher at the Diekirch High School and organized and ran the Boy Scouts Jamboree on the Air Station at Ettelbruck with a Galaxy V

Reverting once more to VHF, Luxembourg's situation and the high plateau location enable QSOs to be made on VHF with Germany, France, Belgium, Holland, Britain, Switzerland, and many other European countries. While I was there we experienced a temperature inversion which produced VHF DX in several directions. LX1SI was active on SSB on 2 meters when I called on him.

Above all, this variety of scenery, this variety of radio conditions, this variety of form of amateur activity can all be enjoyed in a leisurely fashion. The distances are remarkably short. It is but a half-hour's run from beautiful Mullertal to the capital city, or from the high plateau – with excellent propagation of the region around Vianden or Boulaide – to the deep gorges of the Sure or the Entz.

The hotels in many of the little villages are good, and one's nights can be spent away from the noise of traffic and aircraft and the fumes of diesel lorries at elevations of 1500 or 2000 ft in fresh air.

The keynote is leisure. So, by logical extension, as WX is a universally accepted abbreviation for weather, LX could be accepted as an abbreviation for leisure.

. . . G3BID ■

The Mini Products C4 multiband coxial vertical dipole on the Hotel Meyer at Beaufort from which G3BID/LX radiated, with the head of G3BID visible in the skylight.

DUAL GATE MOSFET

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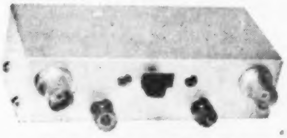

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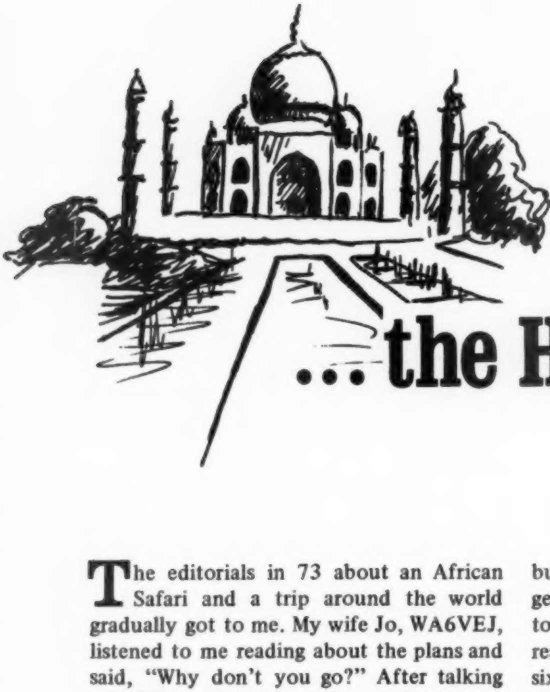

Bill Conklin K6KA
Box 1
La Canada CA 91011

The editorials in 73 about an African Safari and a trip around the world gradually got to me. My wife Jo, WA6VEJ, listened to me reading about the plans and said, "Why don't you go?" After talking with Wayne and my travel agent I could see that it would be almost impossible to get all of the visas needed in the few weeks remaining.

Jo brought me right out of the letdown by saying, "Well, that's too bad, why don't both of us go a little later on?" And there went thirteen kilobucks!

We looked over the weather for each place we wanted to visit and decided that our best compromise would be to go westward, starting in winter.

I had in mind getting on the air from as many of our stops as possible, using local equipment, as Wayne had advocated. An on-the-air discussion of the trip brought an invitation from Trevor (ZK1AR) to visit him for a few weeks in the Cook Islands and help put ZK1 back on the air in style. The license turned out to be no problem, but the visa was contingent upon our getting confirmed reservations out of Raratonga; but, as I found out, there are no reservations out of Raratonga. They have a six-month backlog of people wanting to leave and that is a long waiting line. Well, so much for ZK1.

Letters to embassies were sometimes answered. Some countries would allow me to operate, some wouldn't. India takes 8–10 weeks to grant a license. The Australian license was $A2.40. I considered stopping at Norfolk Island to operate VK9RH, but then I heard that two other ops would be activating Norfolk so I decided that our time might as well be spent elsewhere to better profit. The Russian embassy was hesitant at first, but then an agreement reached by the IARU in Yugoslavia paved the way and I was able to apply through the ARRL and get UI8KAA/K6KA in Tashkent and UI8KBA/K6KA in Samarkand, complete with street addresses and signed by UA3AF. This whole thing took many letters and phone calls to accomplish. I suppose I should have known that it was really just a big runaround, but I was optimistic. Uganda and Iran came up with permission to operate, so things looked encouraging.

Should I take along a rig or plan on using existing equipment as Wayne did on his trip? After mulling over the problems involved, I decided to leave the gear at home and do the best I could in each country. The cost of carrying along a transceiver plus all the accessories I would need to meet the conditions in a couple dozen countries was prohibitive. The rig would have to be able to operate from about 90 to 270 volts at 40–60 Hz. Then I would need antennas, a tuner, and spare parts. It was just too much. Getting all that stuff through customs could be an expensive bore and I could just as well find myself in a position with the equipment sealed in a customs locker in one town where I had entered the country with me wanting to leave from some other city. If I had been going specifically on a DXpedition it would have been different, but in just about every place I intended to visit I would find a local amateur station set up that I could use.

Even though we started over six weeks before the trip to get our visas which would permit us to enter the countries we intended to visit, we didn't have them all by departure time and, even worse, our passports were tied up in the U.S. mail somewhere in Los Angeles or Pasadena. Just five hours before our plane left we managed to find the passports by going through 42 sacks of mail at midnight in the Pasadena office. Traveling is tiring even before you travel sometimes.

We stopped off for a breather at Anchorage and then on to Tokyo. After a few days sightseeing we went on to Hong Kong and met Pete Pitt (FS6FO), a CW man, and Tony Willis (VS6FS) of SSB fame. They hadn't heard about reciprocal licensing yet, so I had to just listen instead of operate. Drat!

Tough luck in Borneo too. Hiew Fui Siong (ex-ZC5VS) at the Posts and Telecommunications explained that there were no active amateurs in 9M6 at the time. There was a nice new ham station at Labuan Island, but our luck running true to form; we were there only for a few minutes for a refueling stop. It continued in this vein at Brunei Town when we missed Mike (VS5MH), who was attending an official luncheon during our short stop. My record was kept clean even in Sarawak when we had dinner and visited Ron Skelton (9M8RS) and his wife. Ron is with Posts and Telecoms and this was not consistent with "authorized operations." We listened.

Bali was a delight as a tourist attraction, but it was the same old story hamwise. The Bali Beach Hotel is $10 for a double room and there are 1200 staff to wait on about 80 guests spread out in the 300 rooms. There are no amateur stations.

The most active of the Singapore amateurs, Bob Snyder (9V1LP), was in Norway, but we did get together with Harry Pain (9V1MT) for dinner and the first break in our operating bad luck. Not much of a break actually, since only a few Japanese stations were coming through at the time and not one whisper from the U.S.

In Kuala Lumpur we visited Nara (9M2LN) and his gracious wife Fatima, but again no operation on the air. Thailand turned thumbs down on an operating permit, though we did get together for dinner with John Moss (HS1WF). No luck in Burma either. In Calcutta, Renga (VU2RF) met us and took us to visit VU2DG, VU2HK, and VU2RK. We learned that a tall man and a woman in hiking clothes had been through the Calcutta airport just recently with a letter from the Maharaja of Sikkim (AC3PT) asking them to visit and operate. YA1FV contacted AC3PT a few days later and the DX newsletters mentioned others making contact.

In Nepal we visited Father Moran (9N1MM) at the St. Xavier's School. He was quite excited over the imminent arrival of a Drake exciter and linear to go with his Drake receiver. We operated his old Johnson Viking with an outboard SSB exciter for a little while, but the band again did not open to the States until well after we had to call it a night. Father Moran proudly pointed out the red sticker on his ceiling which said, "W2NSD/1 was here." The next day, during the SSB contest, a few weak W stations were heard, but nothing was contacted.

In Agra, India, we had dinner with Col. Les King (VU2AK) and Frank Williams (WA6CLO) before going on to visit the Taj Mahal and other palaces in the area. Les had tried to get permission to operate from Sikkim, but had failed. He said that General Singh (VU2US), a member of the Rajasthan royal family, had succeeded in getting permission.

We were unable to find any amateurs in Kashmir. In Afghanistan I was able to locate Fred Vogel (YA1FV) and operate from his station as K6KA/YA for an afternoon and evening. The line voltage in Kabul swings widely and you have to keep one eye on the line meter and one hand on the Variac. Even so this is a poor place for solid-state power supplies for the line voltage can shoot up quite suddenly and wipe you out. The bulk of my contacts were with the neighboring Russian stations and no sign whatever of any U.S. breakthrough.

UI8KAA/K6KA

This was sure to be the most exciting and rewarding part of the trip from the ham end. We arrived in Uzbekistan and tried to find the station I was supposed to operate. The Intourist guide said that the school had been destroyed in an earthquake and he would have to try to find out where the station had been relocated. He said he thought he could arrange for me to operate on the last evening of our visit to Tashkent, which provoked me because I had had visions of putting in four or so hours every day during our visit. He brought the Communications Minister to the hotel the next night, who agreed that I could operate as much as I wanted, at any time. He then proceeded to set up a visit to the station for me for the next day for 30 minutes! Another Intourist guide turned up the next night. He had no idea of where to find the station, but we started out in a taxi and, by asking directions along the way, we eventually found it. The SSB rig was similar to the S-line and ran about 400W. There were about ten people present and we got into a technical discussion of the rig which gave our interpreter a terrible time. Eventually they let me sit down to operate. They had a contact all set up with UA4IF and they let me talk with him. That was it! I was absolutely furious, but polite.

In Samarkand the Intourist guide didn't even pretend to try to help me find UI8KBA. The food and water in UI8 disagreed with us and one fellow who had come up with us lost over 20 pounds during his stay. I don't think I found five bites of food a day that were edible. The beer tasted like vinegar and they ran out of bottled drinks called lemonai almost immediately. The toilets in the hotel were mostly broken and running steadily, so this was solved by just turning off the water for most of the day and night. I tuned a receiver and found that they had some way managed to have only Iron Curtain stations, with not a BBC or VOA station coming through. We had to wait three more days at the Tashkent airport hotel waiting for the rain to stop down in Kabul. This was a relatively new hotel, but it did not have a shower or bathtub in the entire building, which was eight stories high. There was just one toilet seat for men on each floor. The light fixtures were coming off the walls and my bed came apart twice during the night.

EP2GF/K6KA

Harry McQuillan (EP2BQ) met us at the Tehran airport and took us to his nice home, complete with swimming pool, up near the mountains. The local power went through 100V drops now and then, taking along diodes on the upswings. Harry solved this with 3B28's. Ebrahim and Mary Nuban (EP2BF) had a cocktail party for us which was attended by many of the active locals including EP2AX, EP2RV, and Gerry McKee (EP2GF). I used Gerry's call during the few hours I was able to get on the air from Tehran. Later that night I took a taxi

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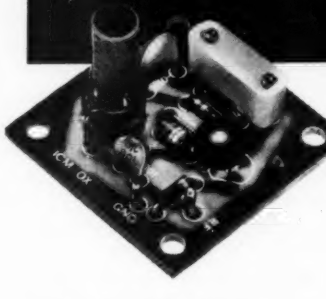

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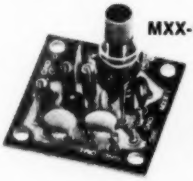

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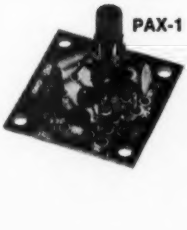

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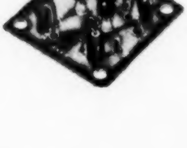

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downtown and visited Ambassador Meyer (EP3AM) at the U.S. Embassy.

We made a short visit to Lebanon, having dinner with Bill Fells (OD5EL) of Collins Radio. Bob Adams (OD5BZ) was out of town at the time, unfortunately. We drove over to the Syrian border and experienced the same delays that Wayne did while our passports were minutely inspected for any sign of an Israel visit. We forgot to bring along Rasheed YK1AA's phone number so we missed visiting with him in Damascus. We went on to Jordan and found that there was no ham activity there either. In order not to cross Israel we flew first down to Saudi Arabia and then across the gulf of Aqaba, the Sinai, and up to Cairo. From there we flew almost immediately down to Entebbe in Uganda and on a tour up through beautiful Murchison Park and a night at Paraa Lodge. Wayne described this same trip to you a few months back so I won't tell you about all the elephants, hippos, crocodiles and other game which is there in profusion.

Back in Kampala, the capital of Uganda, we found a discouraged Ernie Brice (5X5AU). His Swan was defunct. I wasn't about to be frustrated by anything simple so we attacked the rig with an ohmmeter and found that one of the four diodes in the bridge rectifier lacked a high back resistance. We clipped the rectifier out of the circuit, and the radio worked satisfactorily for the three-day period. I spent as much time as I could on the air, but was limited because Ernie had to be with me and I couldn't keep him or his family up too late at night.

Ernie had a minibeam with old coax, so had put up a separate 15m dipole. Not much seemed to come out of the minibeam on 15 and 20. The dipole loaded on both bands, except after a heavy rain one day. Contacts on 20m were difficult, and phone contacts were very slow, but those on 15m CW doubled each day. Some time was used in trying to make a contact near Philadelphia for some missionaries. The scheduled stations did not appear. The ones we heard could not be raised. After the skeds, I was able to make one to five QSOs at a time, which helped to reduce the pileup QRM on the transceiver. When several stations and their RST reports were sent with a request to QRX, everyone knew that it was useless to call until the whole group had a chance to reply. The key was over the table edge. There was no sidetone, though I could hear my pumping arm whizzing through the air. When the U.S. stations were heard, there would be only one or two at a time and no pileup. There was sporadic-E layer en route beyond Europe. At one time or another the signals covered all parts of the U.S., even in my home local telephone area. The condition was typical for northern hemisphere summer.

Ethiopia, Sudan, Greece

Moving on through Kenya, Tanzania, and some exciting scenes of Africa, we pushed for Egypt. At the Cairo airport, the tourist bureau assured us that everything was calm, that we should not cancel our two days in Luxor and three in Cairo. With the unsettlement in Cairo indicated in local and some foreign papers, we followed an Embassy recommendation to go on to Athens. This meant not seeing SU1IM, and getting into Athens with little chance that the airline communications would get us a hotel room there.

Those who were in Cairo during the next few days, which would have included us, were restricted to two darkened hotels, and had to pack in the dark for a truck ride to Alexandria in the hope of leaving by ship. Ultimately they got out. People leaving Beirut had to take only one bag, leaving the rest behind.

Athens was wonderful. There were cucumbers as well as tomatoes, good water, and chateaubriand under the Acropolis. Socrates (SV1AE) spent an hour or two at the hotel telling us of the prospects for the civilian SV1s getting back on the air.

I was able to operate a MARS station as SV0WS for a day. This had the usual S-Line, but the 30S-1 linear was not connected. The 30L-1 on 15m had a peculiarity of making a noise in the receiver. It was necessary to switch the filaments on and off for each transmission.

The rotary antenna was a Hy-Gain log periodic, claimed not to have much gain, K6KA in . . .

Tanzania. . .

Uganda. . .

but it had wonderful directivity. Pointed at Europe, nothing but Europeans came through; pointed at Japan, only JAs came through – with a pileup of some 500 stations. Possibly the JAs had been listening to the European calls, and were ready. Upon excusing myself and swinging the antenna, not another JA was heard. A few Ws came through as far west as W7MSF. Most success was on 15m. This operation could have been drawn out into the evening hours, and again the next day – when we went to Delphi to hear what the Oracle had to say about DX. June conditions were not too consistent for the U.S., and anyhow Greece is not very rare. So, we got ready for our Greek Islands cruise.

We made three stops in the first 24 hours: Hydra, an interesting island with a small harbor; Santorini, a large submerged crater with recent activity from a central cone; and Crete. Bill Corbin, now SV0WL in Crete, received a message we sent at the dock, and looked for us at a museum. He and his wife came aboard for cocktails, but time was too short for a visit to the station. Like in many ships, the scheduled departure of 8 p.m. was anticipated. We were on our way out of the harbor at 7:20!

When we called on the licensing activity in Athens, and met George Chapman of VOA, now SV0WK, the story was that Don Hoff had left Rhodes for home leave. The shortage of calls (one alphabet of 26 calls) led to reassigning SV0WU to Robert C. Smith of the Naval Communication Station near Athens. We wrote to Fred Haney (SV0WQ) about our arrival in Rhodes, which brought a disclaimer from Don who promised to meet us. All equipment had been impounded there when the political unrest came in April, and was still impounded. The civilian SV1s were still off the air in June. The Rhodes gang did not know that the SV0s were permitted to go back on the air in May. My unofficial word was not enough to overrule the instructions to VOA from the Embassy. Office hours are early for the Athens officials; no telephone confirmation was possible that afternoon or evening. The result was a pleasant visit to Rhodes, but the expected

K6KA in . . .

Pakistan. . .

Bangkok. . .

operation had to be omitted to prevent offending someone should I have been incorrect. These political situations are too hot, and violation could be disastrous to amateurs, especially foreign ones, not to take every precaution before operating.

The cruise took us to Efessos in Turkey, near Izmir. It is the site of four cities over thousands of years, and of Paul's epistle to the Ephesians. Then to the island of Mykonos, and back to Athens.

After a happy four days in Vienna, and a flight on Pan-Am over a clear northern Scotland, the Greenland ice cap, the glaciated rock of Labrador, stops in New York, Orlando, and Atlanta, we arrived home. The four cartons of mail, largely 5X5AU/K6KA QSLs, have been taking a bit of time. We missed a bit of DX while away, but saw a lot of it in person. It will be enough to last us a while before we try the leisurely South Pacific trip. Phoenix Islands, anyone?

Sikkim. . .

K6KA in . . .

Santorini. . .

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. . .K6KA■

SPLIT PHONES

A DX Operating Aid

A.D. Taylor GW8PG
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Got two receivers? With a modified pair of phones and a simple switching unit it is possible to have both earpieces connected to receiver 1, one earpiece connected to both receivers, or both earpieces connected to receiver 2. This can be an advantageous listening system.

The System Explained

Putting up a second antenna for receiving is easy, but life becomes difficult when one must juggle two pairs of phones; and two loudspeakers are plain murder! Split phone working eliminates these difficulties. By using a slightly modified pair of phones and a rotary switch both earpieces can be connected to either receiver, or a single earpiece can be connected to each of the receivers at the same time. It is thus possible to monitor two channels at once or one channel on its own merely by flicking the switch.

Typical Examples of its Use

The system has many uses and the three examples which follow illustrate the flexibility which it offers.

Suppose that a ham wants to see what DX is coming through on 20m CW while waiting for the local 75m phone net to open. With split phone working he can have one earpiece connected to his main receiver on 20m and the other connected to the spare receiver tuned to the net frequency. When the NCS calls he can throw the switch and connect both earpieces to the spare receiver, or if a rare DX station comes up in the meantime he can switch both earpieces to the main receiver.

A second example is the common occurrence when it is announced that a station visiting a rare country "will be on either 14.020 or 21.020 MHz, depending upon 'conditions'." With split phone working, both the frequencies can be monitored at the same time. The advantage is even greater if the station uses a transceiver. The receiving can be done on the spare receiver and the transceiver can be left tuned to the calling frequency.

Modifying the Phones

Figure 1A shows a normal series-connected pair of phones. To modify them for split phone working, the connections must be altered to those shown in Fig. 1B.

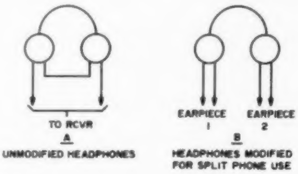

Fig. 1. Unmodified headphones (A) and headphones modified for split phone use (B).

The new phone cord is made from a suitable length of 4-conductor cable which has had 18 inches of its outer cover stripped from one end. The four wires thus uncovered should be split into two pairs and each pair should be twisted together. Each pair is connected to the terminals on one of the earpieces.

The other end of the cable is connected to a four-pin plug. The left earpiece should be connected to the plug so that it connects to receiver 1 as shown in Fig. 2, and the right earpiece connects to receiver 2.

The Switching Panel

Figure 2 shows the circuit of the switching panel. The main component is S1, a 6-pole, 3-position rotary switch. When the switch is in position 1, contacts S1b and S1c connect the two earpieces in series and contacts S1a and S1d connect the phones to receiver 1. At the same time contacts S1e and S1f connect R1 (a load resistor) across the output of receiver 2 to prevent possible damage to its output transformer. When the switch is moved to position 2, contacts S1a and S1b connect earpiece 1 to receiver 1 and contacts S1c and S1d connect earpiece 2 to receiver 2. Contacts S1e and S1f perform no function in this position. In position 3, contacts S1b and S1c again connect the earpieces in series, contacts S1a and S1d connect the phones to receiver 2 and contacts S1e and S1f connect the load resistor across the output of receiver 1.

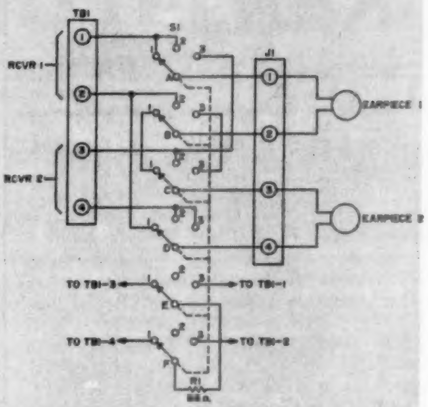

Fig. 2. The circuit of the switching unit. R1 to be a 68Ω, 1W carbon resistor for low impedance output receivers, and a 2.2 kΩ, 1W carbon resistor for high impedance output receivers.

Constructing and Mounting the Switch Panel

This is a simple job. The components can be assembled on a 4 x 5 in. plywood panel or on the lid of a suitable-sized metal utility box. Internal wiring is done with insulated wire and load resistor R1 is soldered directly to the switch tags.

The mounting position of the panel will depend upon station layout. If a control console is used it can be mounted on it.

The Second Receiver

To get the best out of the system, the second receiver should give a reasonable performance. If an old receiver is brought back into service for this purpose, the following hints will help to greatly improve its performance.

Replace all decoupling capacitors in the rf, mixer, and i-f stages with new capacitors of the correct value. This means the plate, screen, and cathode decouplers should be changed. Use new capacitors, not components dug out of the junkbox. Similarly,

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change the af interstage coupling capacitors. If the receiver has built-in power pack, replace the smoothing capacitors. Clean up the wavechange switch with switch cleaner, and realign the receiver to the maker's instructions.

To show just what a remarkable effect changing the decoupling and af coupling capacitors in an old receiver can have, I can quote something I did a few months ago. Poking around a local junk shop I came across a 1936 HRO and bought it for $10. When power was connected it worked, but signals were very weak, there was noticeable distortion on the af output, and the crystal gate only acted as an attenuator. Replacing all the decoupling capacitors in the rf, mixer and i-f stages brought S3 signals up to S9, and also brought the crystal gate back into proper operation. Replacing the af coupling capacitors cleared up the audio distortion, and the vintage receiver is now in use as a second receiver, regularly giving good DX contacts. The moral, of course, is that if you shop around and spend an evening working in the shack you can get the second receiver for split phone working without having to hock the XYL's mink!

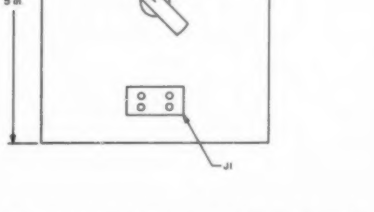

Fig. 3. Layout of the switching unit panel.

. . . GW8PG■

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Telrex Labs are design engineers, innovators and manufacturers of the world's finest ¾ to 160 meter communication systems and accessories priced from $25 to $25,000.

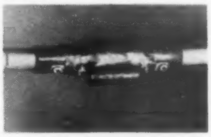
For technical data and prices on complete Telrex line, write for Catalog PL 71.

TB5EM $395

Elements shortened to show details.

BALUN

TRAP



Some thoughts from Mike Ercolino, P.E. — W2BDS, Telrex Chief Engineer . . .

"I've been in the game over 50 years (pounded brass for 25) and found out a long time ago that antennas were the weak link. We changed all that."

"Good antennas such as those we build can be ruined in two minutes by a tinker. So put 'em up and leave 'em up the way we make 'em."

"Our 'Big Bertha' systems cost more than a Rolls Royce. Three of our customers have bought two of them . . . that's living."

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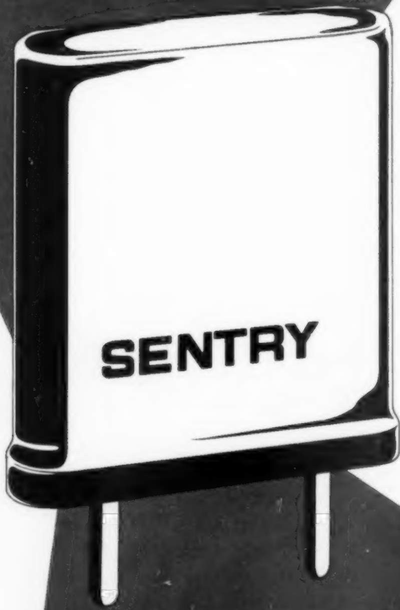
TV And Communications Antennas Since 1921
Asbury Park, New Jersey 07712 201-775-7252

IF YOU'VE EVER USED A REPEATER,

If you haven't
already received
a copy of our **NEW**
1970 Catalog of Precision
Quartz Crystals & Electronics
for the Communications Industry,

SEND FOR YOUR COPY TODAY!



Somewhere along the line, in virtually every ham repeater in the world, you'll find a couple of Sentry crystals.

Repeater owners and FM "old-timers" don't take chances with frequency—they can't afford to. A lot of repeater users depend on a receiver to be on frequency, rock stable...in the dead of winter or the middle of July. The repeater crowd took a tip from the commercial "pros" a long time ago—and went the Sentry Route.

That's one of the reasons you can depend on your local repeater to be there (precisely there) when you're ready to use it. FM'ers use the repeater output as a frequency standard. And for accuracy, crystals by Sentry are THE standard.

IF YOU WANT THE BEST,
SPECIFY SENTRY CRYSTALS.

"Ask the Hams and Pros
Who Build Repeaters!"

YOU'VE USED A SENTRY CRYSTAL

SENTRY MANUFACTURING COMPANY
Crystal Park, Chickasha, Oklahoma 73018
PHONE: (405) 224-6780
TWX-910-830-6425

A SPECIAL REPORT

Ham Radio Manufacturing: A STRUGGLE FOR SURVIVAL

Amateur radio has had more than its share of dropouts, as these memorable old photos attest. But things may be different before too long . . . there are subtle but definite signs of an upswing in the offing.

Ham Dropouts
There was a time when Johnson's Viking units were the most popular items in amateur radio. But Johnson divorced hams when CB came along.

Over the past few years informed marketing specialists and industrial advisors have warned firms against approaching the once-booming amateur radio world with new products. Even the long-time manufacturers of amateur radio gear have fallen on bad times. The market, they've been saying, is "saturated." All the hordes of hams who were to change from AM to SSB when the technology advanced a few years back have already done so; and the changes since that time have been anything but innovative, thus minimizing the likelihood of any large-scale trade-ups on the part of the amateur fraternity.

Some of the staidest "old guard" manufacturers in the ham radio field are in trouble, but they're pinning their hopes on a few areas that still show promise.

Some of the oldtimers will look nostalgically at the gear shown here; these are some of the equipment items that at one time were the [illegible] of the amateur fraternity. Who didn't have a [illegible] Elmac mobile rig, a pair of Gonset "Twins," or one of Johnson's Viking [illegible]. Alas, the manufacturers of these fine old standbys have gone [illegible].

The saturation problems have been intensified, too, by the relatively static position of the amateur radio service. Where the postwar years saw rapid and extensive growth of ham radio, the past few years have reflected a growth rate of little more than 3%. This meager percentage is actually worse than it looks, too, for it represents an actual per-capita decline in total number of active amateurs; the growth rate in the 16-to-35-years-of-age group (considered the most likely candidate to become hams) has been increasing at a rate considerably in excess of the 3% figure. The last few months tend to show a faint spark of revival, however.

Make no mistake about it, some of the staidest "old guard" manufacturers in the ham radio field are in trouble. National Radio, for example, recently went into receivership as a result of declining military orders and the drought in the amateur field. Hallicrafters expanded into the commercial two-way industry, all but forsaking its once-heavy advertising campaign directed to the ham market. Johnson, onetime ham equipment leader, sought greener grass in CB and industrial two-way fields. Collins, once the "cadillac" manufacturer in the field, hasn't added a new item to its line in more years than it cares to think about. Hammarlund's sales declined to the point where the big-time ham receiver maker could no longer justify advertising in the amateur journals. And names like Gonset, Multi-Elmac, Pierson-Holt, Harvey-Wells, Central Electronics, Waters, and others have either dropped out of the amateur business altogether or have defected to the ranks of CB manufacturers.

There are still manufacturers in the amateur field, but – and this is an understatement – they haven't been getting rich. Companies like Drake, Swan, the ailing National, and Signal One are still in there pitching, but the profits don't come easily, and most of the firms admit that they're barely eking out an existence, trying to tread water until "times get better." And it looks now as if they just might.

The problems faced by ham equipment manufacturers have been compounded recently by the introduction of Japanese imports such as the Yaesu line and Henry's Tempo. Not only do these models meet American quality standards, but they set price standards as well, making it difficult for the U.S. manufacturer to compete successfully while retaining his fair share of the profit dollar. "It's bad enough," says one American manufacturer, "for us to be faced with an already saturated market, but now we have to fight for survival in an area barely able to support us in the best of times." The manufacturer was referring to the fact that, even when ham radio was considered to be "booming," it was still not in the same league with such markets as CB and the hi-fi/stereo industry. And competition from foreign makers makes the prospects for ultimate pullout of the economic slump seem bleak.

The outlook may not be as dismal as it seems at first glance, however. Some recent trends seem particularly encouraging to far-sighted American firms. For example, the U.S. market may have been diminishing or stagnant, but recent indications point to real improvement ahead. And the foreign

Some of the oldtimers will likely [illegible] of the gear shown here. These are some of the equipment items that at one time were the bulwark of the amateur industry. Who doesn't know someone who [illegible] a pair of Gonset "Twins," or one of Johnson's [illegible] the manufacturers of these once-old standbys that have [illegible]

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The outlook may not be as dismal as it seems at first glance, however. Some recent trends seem particularly encouraging to far-sighted American firms. For example, the U.S. market may have been diminishing or stagnant, but recent indications point to real improvement ahead. And the foreign market is showing signs of a genuine growth surge. As economic conditions in other nations improve, so do interests in such comparatively leisure hobbies as ham radio. And several American manufacturers are looking to that foreign marketplace as the next major developmental area.

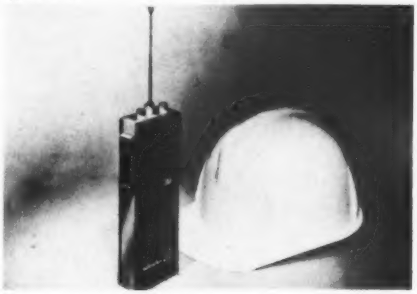
According to a recent article appearing in *Electronic News*, at least three manufacturers were eyeing the foreign market, and the fact that others were making similar overtures was implicit in the article. There is good reason to believe that U.S. manufacturing techniques, marketing knowhow, and technological developments could meet foreign makers head-on successfully in their own territory – thus giving the competition a taste of their own medicine.

U. S. ham-equipment manufacturers could meet foreign makers head-on in their own territory.

An area that could have a dramatic and forceful influence on the ham radio fraternity is that of the somewhat controversial "hobby" band proposal. This plan, currently being considered by the FCC, would open up a portion of the 220 MHz spectrum to individuals who want to become hams but for one reason or another can't master the traditional code requirement.

Passage of the "hobby" license plan would make hams of thousands of wives who'd like to share the fun of ham radio with their husbands but who just can't spare the time or generate the interest necessary to comply with all the requirements for a General or Technician ticket. It goes almost without saying that initiation of a hobby license would bring new life into amateur radio as well as into the ham radio manufacturing industry.

There are still amateur radio operators who wonder why more ham operators would be desirable. In a 73 "letter to the editor," one ham recently wrote, "Who needs it? The more operators there are, the more interference we must contend with." The amateur lost sight of the fact that without a good "market" of hams, there would be no radio equipment industry – and without the industry there would be little if anything to attract new amateurs. And without an influx of amateurs, the ham ranks would wane. Ultimately, other radio services – ever hungry for additional spectrum – would make inroads into those remaining amateur frequencies. The result would surely mean the demise of amateur radio.



Unable to make a go of it by sticking strictly with the ham radio field, Hallicrafters pushed off into the more lucrative commercial two-way industry. This photo shows Hallicrafters' successful 4W pocket transceiver for commercial service. Marketing men at Hallicrafters are alleged to be considering the prospects of making a version of the unit available to the amateur VHF FM operator.

It is a fact that the so-called "appliance operator" is the life's blood of ham radio. Questionnaires published and distributed by 73 Magazine showed that more than 97% of all active amateurs are indeed appliance operators – though not exclusively.

In a nutshell, amateur radio needs the equipment manufacturers – but the radio market has shriveled to such an extent that most manufacturers feel something "really big" is needed to properly reinflate it. The hobby band proposal holds a great deal of promise here in the U.S.

VHF FM is proving to be a vitally need shot in the arm for ham radio.

There are still other signs of salvation here at home, too. One of the most

Here's The Mobile FM AFTERBURNER

VARITRONICS
PA-50A SOLID STATE AMPLIFIER

Amateur Net
$129.95

Delivers 50 Watts of Punch on 2 Meter FM

The Varitronics PA-50A is a completely solid state Class C RF amplifier designed specifically for use in mobile amateur FM applications. Internal RF switching makes the PA-50A useable with any amateur FM transceiver with 10 watts* output. Balanced emitter devices are employed which are completely insensitive to high VSWR or even no load conditions at its output. This handsome and ruggedly built amplifier is styled like the IC-2F transceiver, features a calibrated output meter and is supplied with mobile mounting bracket and DC cord. For the big signal on FM, try it!

SPECIFICATIONS

*Drive Requirements	12 Watts Maximum 5 Watts Minimum
RF Output	50 Watts - Less with lower drive or input voltage
Power Requirements	13.5 VDC@5Amps
Impedance	50 Ohms In/Out
Frequency	Any Portion of Amateur 2 Meter Band
Spurious Products	50DB Down
Dimensions	6" X 7" X 2"

Manufactured by Varitronics . . . still the leaders in quality amateur FM equipment.

See it at your dealers.

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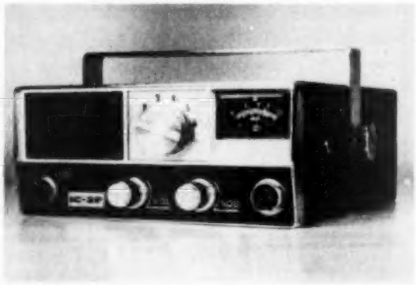
2321 EAST UNIVERSITY DRIVE • PHOENIX, ARIZONA

important elements of amateur growth in recent years has been the advent of the VHF FM repeater. The result of this development has been nothing less than a vital shot in the arm of amateur radio, even though not quite of the magnitude required to sustain the whole industry. American manufacturers, by experience wary of "fads," stood by while Japanese imports snatched a huge chunk of the FM equipment market, which was being shared only with the purveyors of used commercial surplus equipment. But as the surplus market dried up, and the demand for more FM gear continuedd, American manufacturers began responding.

Keenly watching the unprecedented success of Varitronics, Incorporated – which began on a shoestring and is currently the unchallenged leader in the 2 meter FM field – the U.S. industry was determined to gain a foothold. Varitronics offers a line of Japanese imports at prices that are typically American, so the profit margin was wide enough to warrant a few cautious incursions into the apparently lucrative field. Besides, according to some of the recent manufacturing newcomers, there was nothing to lose – because VHF FM is virtually the only aspect of ham radio that is exhibiting any growth at all.

The first of the American firms to try for the FM market was International Communications and Electronics Company, a small Texas corporation. But ICE dropped out of the running within a few months due to design problems, inadequate servicing facilities, and premature release of production models that had not been debugged fully. But the imports kept coming and were being accepted by anxious amateurs hungry to get going in this rapidly expanding field. Varitronics retained its lead, though other distributors made attempts to challenge the leader with Japanese imports of varying degrees of quality and price.

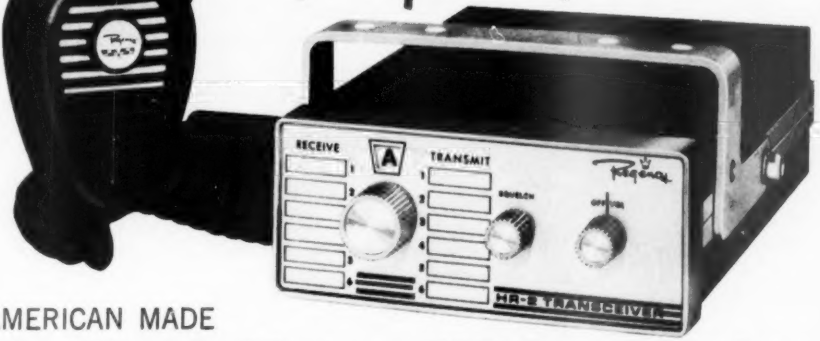

An act that's hard to follow. The Varitronics import, Model IC-2F, is a compact unit that combines transistors and ICs, packs a 10W punch, and includes circuit that shuts down rf output when the vswr on the antenna gets uncomfortably high.

Clegg
22'er
F-M
One of the newer entries in the 2 meter FM field is the 22'er by Clegg. This unit uses vacuum tubes in the final to produce more power output than is available on most transistor types. With a tunable receiver calibrated to match existing FM channels, the 22'er marks a departure from crystal control. To preclude the possibility of losing sales because of the lack of fixed-channel control, Clegg is also reportedly about to produce a fully synthesized receiver, which allows the operator to "dial" any FM channel between 146.04 and 146.6.94, retaining the desirable characteristics of crystal control without sacrificing the stability and repeatability normally lost with continuous tuning.

In the face of ICE's disaster and the phenomenal success of Varitronics' import line, another American firm made its debut against bets within the industry that this new upstart, World Radio Labs, would be heading for an early failure. Bu the line – Galaxy – made it. Finally an American made unit was successfully selling against the hot Varitronics line, and even though it couldn't match the Varitronics unit in performance, it sold at a price well below that of the import.

The eyebrows of other American manufacturers were raised as Galaxy continued its erosion into the market that most experts said was spoiled by "low-priced used gear and Jap imports." And before long other U.S. makers jumped in, each with improvements and innovations that

Regency HR-2



AMERICAN MADE

Mobile 2 Meter FM Transceiver

Here is what the 2 meter, FM Ham World has been asking for.

Specifications: 90 day warranty

RECEIVER

The HR-2 receiver is a double conversion, superhetrodyne with highly selective ceramic filter.

Frequency Range	144-148 MHz
Sensitivity	0.35μv (nom.) 20DB Quieting
Selectivity	6DB Down ± 16KC 50DB Down ± 32KC
Audio Output (3-4 Ω Speaker)	3 Watts 10% Distortion 5 Watts Maximum
Channels	6 Crystal controlled with provision for adding an additional 6 channels
I.F. Frequencies	10.7 MHz & 455KHz

TRANSMITTER

The HR-2 transmitter uses phase modulation for the ultimate in carrier stability. Built in SWR load mismatch circuitry provides protection against open and shorted antenna conditions.

Frequency Range	144-148 MHz
Power Output	10 Watts (min.) @ 13.6 VDC
Modulation	Phase Modulation with automatic deviation limiting
Deviation	Automatic Limiting with internal adjustments from 0-15KC deviation
Microphone	Plug-in, hand held, high Z Ceramic supplied
Channels	6 Crystal controlled with individual trimmer capacitors for Frequency netting

GENERAL

Power Requirements	13.6 Volts (nominal)
Receive (Squelched)	180 MA.
Receive (Max. audio output)	800 MA.
Transmit	2.5 Amps (max.)

STANDARD EQUIPMENT

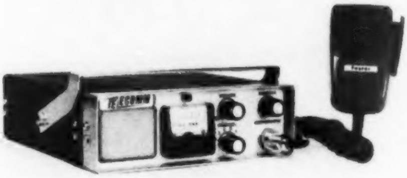
Built-in 4" Speaker
Mobile Mounting Bracket
SO-239 Antenna Connector Socket
T & R Crystals for 146.94 MHz
PTT Ceramic Mike

only $229^{00} Amateur Net

Regency **ELECTRONICS, INC.**
7900 Pendleton Pike, Indianapolis, Indiana 46226

This is actual size and shape of our radio. Cut it out and place it under your dash to see how compactly it fits.

Telecomm, a California company, imports the 10W unit shown here, but stocks the integral modules as well. The module boards include the receiver, transmitter, and power amplifer.



commanded the attention of the VHF FM enthusiast.

First there was Regency, with plenty of channels, lots of power, and virtually no "frills or fancy stuff." The Regency unit was priced plainly to grab Galaxy's increasing share of the market – it bore a modest retail tag of $229 and set new standards of performance within the American radio manufacturing industry. Then Clegg, who was determined to market a transceiver that provided all the advantages of crystal control for the transmitter, but the flexibility of tunable control for the receiver, introducted its unit – with a whole new set of standards. It had a tunable receiver that was as hot as a stovetop and a transmitter that combined tubes and transistors to pump out more power than any of the competition.

The most recent entry, Drake's "Marker," is a hybrid of sorts. It is a Japanese import, but it is being marketed by an American manufacturer as a compromise between Japanese production capability and American expertise in peripheral servicing and marketing.

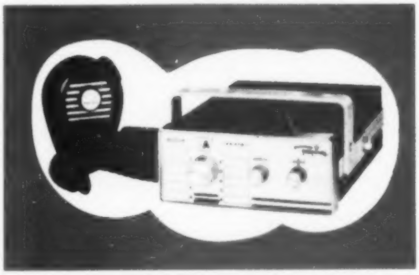
In spite of the growing involvement of American makers in the traditionally Japanese-dominated field, the inward flow of the import continues, each unit touting new concepts or features. Telecomm, for example, imports not only a conventional 2 meter FM transceiver but a complete line of receiver, transmitter, and power amplifier circuit-board "modules" as well.

And the market shows no signs of losing any activity in the near future either, even though it should get progressively more difficult to show a profit in view of the increasing competition. Each month, several more firms announce new VHF FM gear to be made available. And even those manufacturers who looked once at the market and turned away are reportedly making a more thorough reexamination of it now. In this latter category are companies like Heath, Hallicrafters, Swan, and even Johnson. The going won't be easy for any of them, though. Yaesu is on its way with a 2 meter FM transeiver, for example, and so is Trio. And the Standard import, at one time strictly "marine," turned to the ham market and is reportedly making headway with its own expanding line. So the competition will get tougher and tougher, even though most of the manufacturers can hardly keep their delivery apace with new-unit orders.

Even those manufacturers who became disenchanted with the ham market are taking a second look.

The impact of all this in-fighting could have a dramatic and beneficial influence to the ham in terms of total value per dollar of investment. But most important of all is the fact that this flurry of activity on our VHF bands has already begun to draw more people into the ranks of ham radio. And many of the inactive oldtimers have already come out of hiding to join the swelling ranks of the FM'ers.

It is quite likely that the growth of amateurs in the VHF ranks can more than



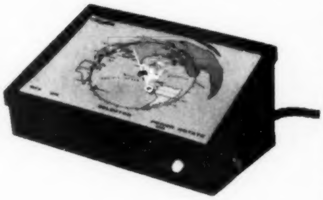
This tiny 10W transceiver is Regency's bid for a share of the low-budget 2 meter FM transceiver market. It has a 12-channel capability and no frills. Sales price: $229.

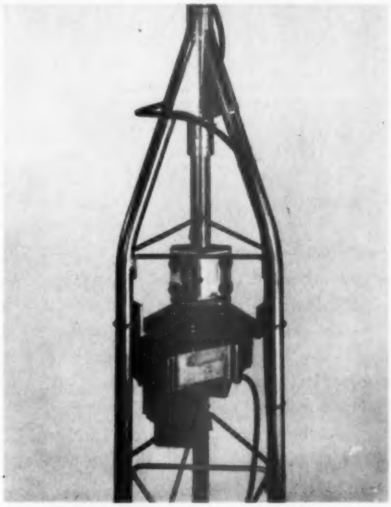
the most powerful signals under the sun!

hy-gain

400 ROTO-BRAKE

Up to 10 Times the mechanical and braking capability of any rotator on the market!





- Handles large beams and stacked arrays with ease
- Delivers over 4,000 IN/LBS of starting and rotating torque
- Gear train protected by husky cast aluminum housing
- Solenoid operator brake adjusted to slip at 5,000 IN/LBS to prevent damage
- Extra heavy duty machined steel gears for maximum strength
- Handsome control unit features sweep pointer over choice of three great circle maps or compass rose
- Select desired position and rotator's logic circuit brings into desired position
- Capacitor start for high torque
- Operates off 110VAC 60 cycle power source
- No blind spots—moves 380°
- Antenna automatically moves to position when control is activated
- Heavy duty mast clamp takes up to 3" O.D. mast
- Mounts to standard tower plate with min. of 10" tower leg spacing
- Mounting kits available for poles or small towers
- Universal tower mount available
- Temperature range—30° F to 120° F
- Permanently lubricated
- Requires one 5 wire cable
- Cable available from Hy-Gain 412

Buy a 400 ROTO-BRAKE from the best distributor under the sun—the one who stocks Hy-Gain!

Model No. 400 Suggested retail price **$189.95**

HY-GAIN ELECTRONICS CORPORATION
P.O. Box 5407-GA, Lincoln, Nebraska 68505

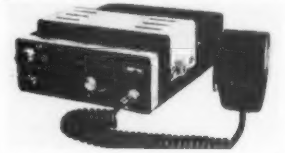
accommodate the growing list of VHF FM manufacturers. The plain fact is that at no time in the history of ham radio has this current expansion of FM interest been paralleled. Even the development of sideband in the late fifties and early sixties was incomparable in terms of adding new faces to the existing ranks. And there appears to be no end in sight!

VHF FM population is pushing 30,000, and there's no indication of any letup.

In 1969, during the heyday of FM Journal, there were an estimated 10,000 active FM'ers. Today, there are easily more than 2-1/2 times that number, and an estimated additional thousand operators appear each month. The repeater directory published by 73 Magazine (April 1970) listed some 250 active open repeaters and made reference to a large number of additional closed repeaters. An updated directory currently being prepared for the April 1971 issue of 73 already lists more than 500 repeaters, and this figure is expected to increase by no less than 25% before the publication deadline.

Also, despite the increase in the total number of open repeaters, owners of the "standby" repeaters listed in the previous directory tend to report a substantial increase in the number of user stations. These factors, and others, point to a VHF FM population that is very closely approaching the 30,000 mark – which surpasses the total circulation of two of 73's competitors!

To the great relief of manufacturers and dealers in the ham radio field, the current VHF FM boom has had little if any negative effect on the conventional amateur market. Indications are that a number of the new FM'ers are indeed from the dyed-in-the-wool low-band SSB crowd, but there is no indication that the newcoming FM'ers are deserting their old modes. Wayne Green, publisher of 73 Magazine, says he makes it a point to delve into the question at conventions, club meetings, and at every opportunity. "It appears," he said, "that VHF FM is more or less universally taken up by the sidebander as a supplement to his hobby rather than as a replacement. Amateurs who operated on other bands before trying 2 meter FM continue to operate on the other bands. They use FM as something of an intercom among themselves to keep each other apprised of DX conditions such as rare station appearances and band openings, to maintain car-to-car communications at transmitter hunts, to pass traffic, or to participate in public service functions."



Drake's "Marker Luxury" transceiver is the latest entry into the booming 2m FM field. Selling for about $330, the unit comes with 12-channel capability (two sets of crystals supplied). Conservatively rated at 10W out, the transmitter section uses transistors for all stages except final amplifier.

At this stage of the nation's economy no one will deny the very considerable medicinal effect FM has had on ham radio. As Herbert W. Gordon, a well known New England amateur radio dealer puts it, "I wonder how many of us would be able to keep afloat if it weren't for the tremendous amount of activity in VHF FM. Equipment sales in this area are leading all other amateur sales by an unbelievable margin."

Smooth sailing for the amateur radio equipment business appears now to be right around the corner. Foreign sales holds promise for many manufacturers. The FM field is attracting more every month. The amateur ranks are at long last projected to be on the upswing. There are signs that the economy of the country will be pulling out of the downward spiral. There is good evidence pointing to a favorable reaction of a hobby license for the 220 band. And semiconductor advances seem to indicate a new generation of low-cost components in the future. All these factors weigh heavily in favor of our equipment manufacturers, who have weathered the worst storm in the history of amateur radio.

HEATH TENER MODIFICATION

Dick Ellers K8JLK
426 Central Parkway SE
Warren OH 44483

Much has been written about Murphy's Law and other such disaster syndromes, but it has only been a matter of recent time that I have dared to admit the existence of the excruciating Ellers Effect.

The "effect" in action would have me put a Heath Tener in the car, start off for some mobiling, but promptly blow the 1.5A fuse because I had forgotten to install the heavier 8A protection required for the dc supply.

Conversely, and with greater risk, having installed the 8A fuse, I would then use the Tener on the ac supply. The oversize fuse protection threatens total wipeout.

As the expression goes: "I may be crazy, but I am not stupid." After several decades of living with the Ellers Effect (EE) I have learned to at least try to outfoil my own forgetfulness. So I modified the Tener – a 10-minute project any Tener owner can and should accomplish.

I cut holes in the rear chassis and case and installed a second fuseholder. I then rewired the power input circuits (see diagram) and also the output of the dc supply. I used decals to identify the fuseholders. Now both fuses are in place at all times, and the proper fuse is automatically selected when either power supply is connected.

Another Tener modification (a matter of convenience not involving the EE) was the drilling of holes, in the cabinet top, large enough to pass tuning wands down to the rf coil slugs.

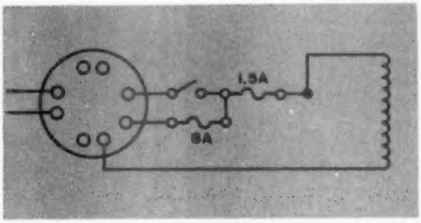


Fig. 1. Modified input wiring.

This eliminates having to remove the Tener from the case to peak these coils for different antenna arrangements.

Careful layout of these holes will mean you can drop the wand straight down onto the slug screws. But even so, you can peek through the vent grill enough to get the wand where it belongs.

Dick Ellers K8JLK ■

TESTING THE RP ELECTRONICS COMPRESSOR

When the pile starts building up on a rare one you need that extra oomph to get a word or two in edgewise. Once you have your kilowatt and your three-element beam, like the others in the pile, what can you do to get that edge? It will not come as any big news that the next step is either an illegal attic antenna matching unit (with power supply) or a compressor.

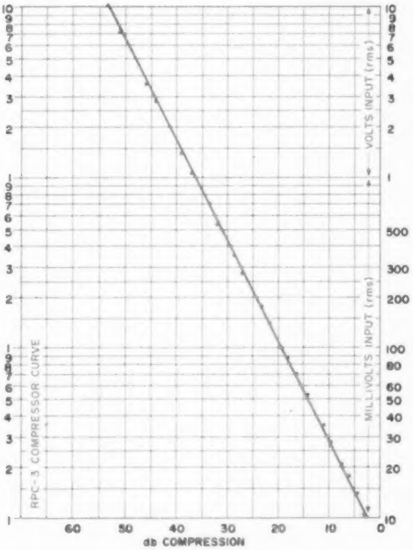
Do compressors work? Of course they do! If they didn't you wouldn't see quite so many on the market. Like everything else available to us, some work better than others. The RP compressor is recommended highly in the ads so it was decided to test one at the 73 HQ station to see if the on-the-air reports were as enthusiastic as the advertising manager of RP.

In answer to a request to test, in came a little box. The RPC-3C measures 4 x 4 x 4 in. and has one in-out switch on the front panel plus a screwdriver pot adjustment for level. One might wish for knobs to twiddle, but they are unnecessary and probably would only permit things to get out of whack. There are two jacks in the back, one marked in, the other unmarked, obviously "out".

The installation of the unit takes several hundred microseconds, while you plug your mike into the RPC-3C and run a patch cord to the mike input on the rig. Flip the switch to "in" and jump into the nearest pileup.

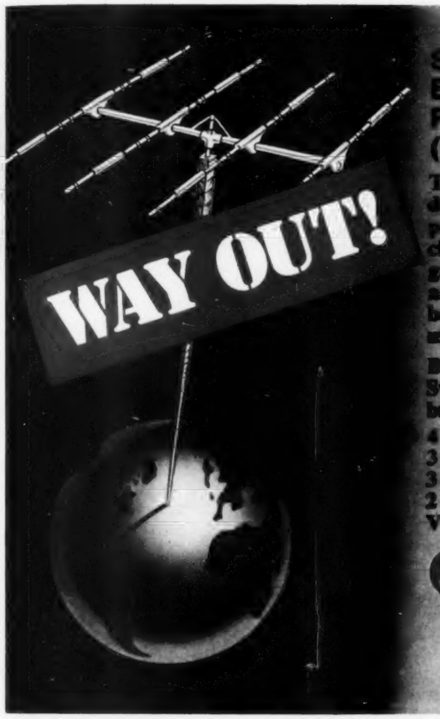
What reports did we get using the compressor? On the average one S-unit improvement was reported consistently by operators in all parts of the world. And what about distortion? This is the problem with most compressors, so particular reports were requested on speech quality. The unit does change the sound of the voice, but no distortion was noticed or reported. Mostly it gives the voice a lot more punch.

Many articles have been written on the basics of compressors and why they give this boost to output power. Nutshelled, they raise the average voice level by compressing the peaks by as much as 30 dB and leaving the valleys alone. This permits a higher gain without distortion. It does not sound like hi-fi, but it sure punches through when there is interference or the signal is down in the noise.



RP has units that sell from around $20 to $35, depending on the model.

. . .Staff■



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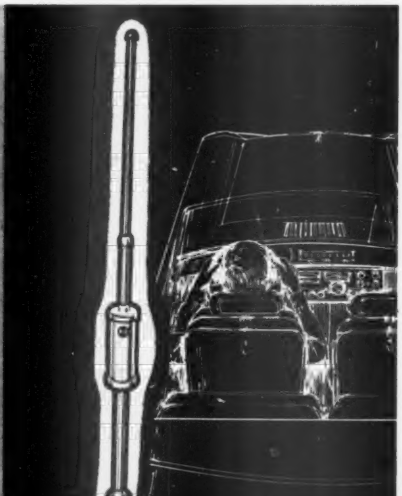

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for the love of a

Betty J. Daniel WB6AOF
12195 Butterfield Pl.
Chino CA 91710

If a wife wants to share her husband's interests and be able to talk intelligently to him about his work, she must put forth her best efforts to learn all she possibly can about the things that interest him most in life.

A simple fact? Well, maybe for some wives who are married to doctors, attorneys, etc. BUT – what do you do when your husband owns and operates an industrial 2-way radio service and his hobby is "hamsville"? Ugh! I can't think of a thing that would be less interesting for a woman than learning the Morse code, much less about the electronics involved in 2-way radios. Double ugh!

But, my self-claim to reasonable smarts and my strong desire to please my choice of mates had forced me into the woes of applying for a ham license. After all, how much could there possibly be to learning how to push a button on a mike and saying, "Fine business, OM. . ." Oh me, oh my! I had a lot to learn and then some.

I mentioned my eagerness about becoming a ham one evening to my spouse, Fred, and he grinned from ear to ear. Fortunately, we have a friend who has the class of license one needs to enable him to give and supervise someone taking the FCC exams. One phone call is all it took to get myself into the worse mess I have ever lived through in my life!

The very next evening, our friend, whom we shall call Don, appeared on our doorstep with an armload of books, paper, pencils, and application for my exam.

My first instructions were to the effect that although Don is a personal friend, if and when I took my exam, I would be strictly on my own – no cheating and no help during the test. Of course, I resented being told such a petty thing since I have NEVER cheated on a test in my life! Well, maybe just a little, but never anything really important like getting my very own ham license.

The first thing I had to do, of course, was learn the code. The initial few dits and dahs were no problem at all; in fact, some of them were rather cute. We worked on the simple ones first, like o, e, i, s, and d. Groovy! No problem. Nothing to it! All was just great. If there weren't so many dahs in the middle of dits and dits in the middle of dahs, I could have stayed out of trouble. But as it was, I was becoming confused and couldn't seem to keep things in their proper order. In the first place, a dit had always been a dot and a dah had always been a dash to me. And then came the big announcement – I had to learn the entire alphabet, numbers from 0 to 9, punctuation marks, and be able to send and receive five-letter words at the rate of five per minute!

"Forget it! I quit!" was my reaction. "I'll never be a ham." That ended my first lesson and as far as I was concerned, my last.

For three days I was teased, pestered, threatened, dared and double-dared by friend and hubby. I had chanced a few peeks at the code and before our next session with the books, I had managed to learn a few dahs and dits all by myself. Don would like to think that he alone was responsible for my code learning, but I put in many hours on my own to get it mentally entrenched.

Finally, I was ready for my code test. Don would send and I would receive. All went well. My turn to send and Don was on the receiving end. I made up a sentence and wrote it down first. It was hopeless! Don couldn't keep up with me! I guess it was a bad case of nerves on my part because slowing down didn't affect my needed speed at all. Figuring that I had already conquered the hardest part of the test, I was eager to get started on the next phase.

I must hand it to all the male hams everywhere who have ever had to teach a female the basic fundamentals of electronics. I became bewildered, confused, argumentive, bored, tired, and completely unreasonable during the weeks of study that followed. I could see no reason why I had to learn so much. For one thing, I never intended to build my own radio; all I wanted to do is push a button and keep track of my old man. I continuously rebelled and refused to accept a simple answer for anything. I begged Don to put it all on a tape recorder so I could plug it into my ear while I was asleep. I bought a book on self-hypnotism and another on self-mental-magnetism, but nothing seemed to work. By then, I was a desperate woman.

Don had given me a deadline and it was only a week away. I was on my own, and any last-minute cramming had to be done with no help from anyone. I calmly assured myself that I would never pass the test. I was convinced that hams must be the smartest people in the world. For the first time in my life, I felt like a housewife instead of my usual self-appointed title of household engineer.

When D-day came, I woke up with a headache. Every conceivable inconvenience plagued my entire day, with a few acts of stupidity thrown in for excitement. I brought in the mail, took meat out of the freezer for supper and spent the next two hours looking for the mail again. I had put the mail into the freezer and the hamburger on my husband's desk. I was so nervous that I forgot to have a cigarette until late afternoon.

Don was invited for supper and I decided to let the men fix their own hamburgers. In my state of mind, charburgers would have been the order of the day. A plate was put before me and I couldn't eat a bite. I had to wait until everyone finished eating before starting on the test. I think Don and Fred really enjoyed watching me squirm. They seemed to take hours eating their one lousy sandwich.

It has always been my practice to complete a test or exam as fast as possible, checking questions I'm not sure about as I go along to answer after the completion of the easier ones. It took about 45 minutes to run through and answer the questions that I knew without hesitation, another 45 minutes on the tricky ones and I was done. Don looked briefly over my test, kept a straight face and didn't say a word. The rat.

Without saying yay or nay, he mailed my test back to the FCC. I'm usually a patient person but waiting drives me up a tree. After two months, I was convinced that either (1) I must have failed or would have heard something before then, (2) the FCC decided not to issue licenses to females this year, or (3) my perfectly adorable mailman enjoyed my daily rush to the mailbox so much that he had decided to tease me a little bit.

I calmly broke my neck trying to catch the mailman on May 10, 1970, three months after my exam, to find a letter in a plain white envelope addressed to me with the call letters WB6AOF following my name. The return address was from Providence, R. I., one S. S. Dana WN1MYB, whom I had never heard of before. I learned that Dana had received his ticket and as a bonus, they sent him a spare – mine. I was elated, to say the least. I had what is commonly referred to as a typical woman's reaction – I sat down and bawled.

Now I am the recipient of literally tons of "ham mail" and I love it. I was immediately urged to join the ARRL (American Radio Relay League) and I irritate my husband monthly by stealing his copy of 73. And to top it all off, in January I can go to SAROC in Las Vegas and be officially registered to win the grand prize in the drawings.

I'll go, but I have a hunch that if I win anything, there'll be some ham in Tinyville, Maine who'll tell me the news, maybe a year or two after the drawing.

. . . WB6AOF ■

Neil Johnson W2OLU
Tappan, NY

DUTY CYCLE DUTY FACTOR

Duty cycle, duty factor, what's it all about anyway? Before the war this expression was seldom heard. With the advent of radar, the expression entered our technical vocabulary. More recently, with the widespread acceptance of single sideband, the term has become part of amateur jargon.

Briefly, duty factor can be explained as "how long you hold the key down." If a ham operator were to tie the key down, and then run the output from his rig into a dummy load, the key-down time would be 100%, and likewise the duty factor.

The nearest ham equivalent to 100% duty factor is in the operation of radioteletype equipment, using frequency-shift keying. The key-down time in this mode of operation is in the neighborhood of 98%, which closely approximates our reference figure of 100%.

With hand-keyed CW emissions, the amateur may expect a duty factor of approximately 48%. This is not a hard and fast percentage, since human characteristics such as the individual "fist" enter into the picture. Commercial stations which utilize automatic keyers generally allow for 46% duty factor. This is based upon certain norms, one of which allows that the word *Paris* is typical of run-of-the-mill commercial radio telegraph traffic. This convention also allows for the general acceptance that one dot space (called one "baud" by the commercials) is okay for a dot, and three bauds constitute one dash. There are allowed for automatic transmission one baud between parts of a letter, three bauds between letters, and five bauds between words. It adds up to about 46%, but most amateurs when using CW can assume 50% "duty factor" and come reasonably close.

Single sideband, suppressed carrier transmissions are generally conceded to put the lightest load of all upon the system and its power supply. Again there are no infallible rules, due to individual speech patterns, but it is generally agreed that SSB transmission may load down the equipment as little as 27%. However, a duty factor of 40% would realistically reflect typical amateur operating conditions. If some form of speech compression or limiting is used, the talk power will be increased, and the duty factor would increase a bit.

When the RTTY, CW, or SSB operator switches from send to receive, the only power consumed is the bleeder current. This current may be bled off through a fixed resistor, or the final amplifier tubes may be biased to perform this function.

Both the power supply and rf section must be taken into consideration when duty factor is being figured. With respect to receiving tubes being used for service, the ham designer may figure roughly "plus 50%" when going from consumer sweep-tube ratings to amateur ICAS ratings.

. . .W2OLU ■

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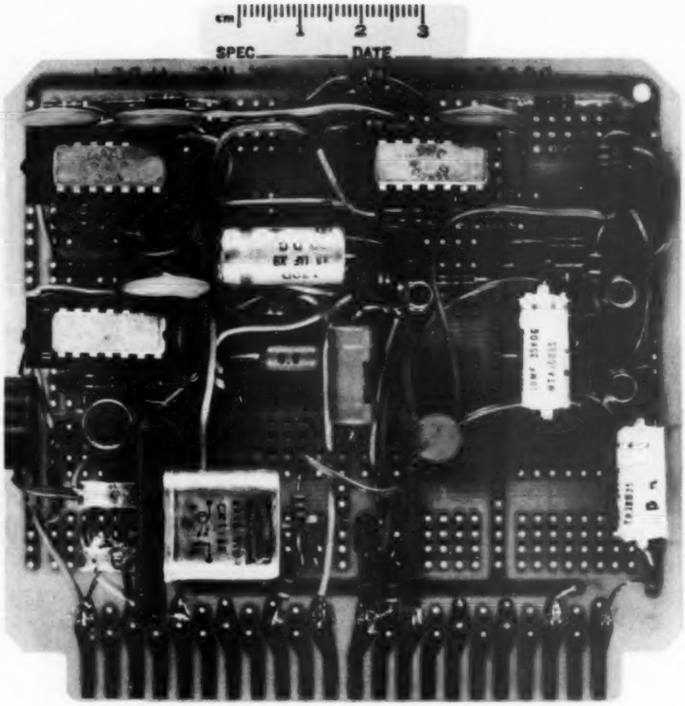

REPEATER ZERO BEATER

One of the biggest problems with an FM repeater is getting everyone's transmitters exactly on frequency. It is even more important with a narrowband input; yet, since most hams do not have ready access to a frequency meter or counter, it is rather difficult to do. This article describes a device that uses the repeater's receiver as a reference and makes it both convenient and easy for everyone to get on frequency. It is as accessible as the repeater, and in effect, is the same as having someone always monitoring the repeater receiver's discriminator voltage and giving back the reading after each transmission (but without the basic personnel problem). Since it is always there, it allows anybody using the repeater to see how well his rig is staying on frequency.

The device is called a zero beater because it produces an audio tone which behaves in exactly the same way as a heterodyne (although it is not). The zero beater operates by monitoring the repeater receiver's discriminator voltage during a transmission and storing a representative voltage in a capacitor. When the transmission is completed, this voltage is converted to a tone, which is transmitted during the repeater's tail period (approx. 1 second). All it takes then, is two seconds to check frequency; a one-second transmission to establish the frequency, and one second to listen to the tone. If the frequency is less than 1 kHz off, no tone will be heard. Each time the repeater is keyed, the process repeats, up to 15 seconds of repeater use. Then the zero beater is disabled until the repeater is idle for 15 seconds or more. (The disabling feature was added after the zero beater was installed because the squeaks and squawks tend to become objectionable with excessive use.)

Operation

The zero beater is built on a 4 in. square plug-in board and requires ±15V for operation. Referring to Fig.1, which is a schematic of the completed device, the receiver's discriminator voltage is applied through a resistance of 100 kΩ to the noninverting input of opamp A1. The operation of A1 is bipolar so that the polarity of the output voltage will swing positive or negative to follow the polarity of the input voltage. The output of A1 is applied simultaneously to the inverting input of A2 and to D2. The output of A2 is applied to D1. When the output voltage of A1 is positive, D2 conducts and the output voltage is applied across C2 (when Q3 is normally cut off).

When the output of A1 is negative, D2 is back-biased and therefore disconnected, while the output of inverter A2 now swings positive, forward-biasing Dl, and voltage appears across C2. Because of the operation of D1 and D2, the voltage appearing across C2 is always positive regardless of the input polarity.

The output of A3 drives Q1, which in turn drives a CK1122 "Raysistor." The Raysistor consists of a tungsten filament lamp and a cadmium-sulphide photoresistor in the same package, with the lamp illuminating the photoresistor. The 8.6V zener (D3) across C2 prevents the voltage across the lamp from becoming too high. The photoresistor portion of the Raysistor is used as a frequency determining component in a unijunction oscillator circuit (Q2).

The dark resistance of the photoresistor is high enough to prevent Q2 from oscillating. As its resistance decreases, the frequency of Q2 increases up to about 2 kHz. While a signal is being received, the frequency error seen at the discriminator is stored by C2 and, through A3 and Q1, illuminates the Raysistor lamp. At the same time, the positive voltage (A) applied

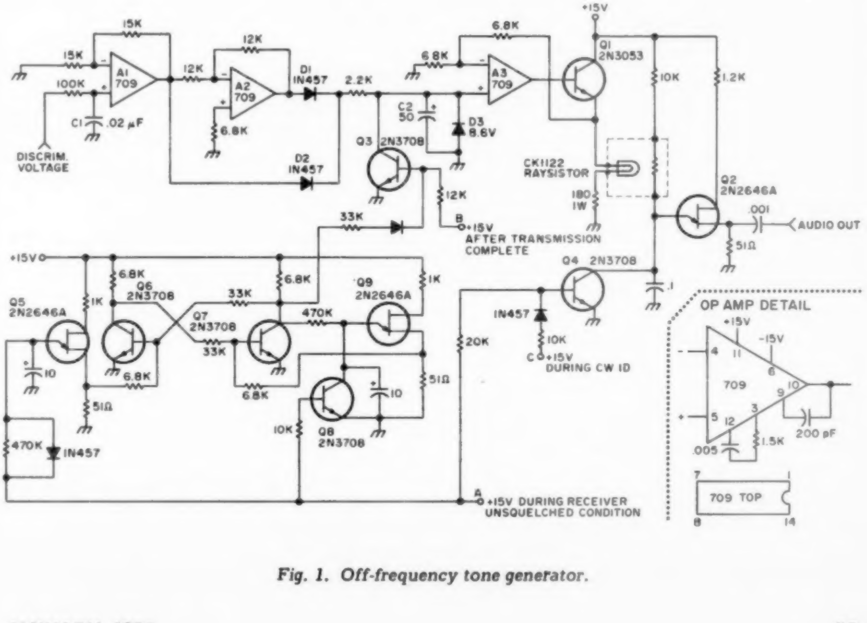
15K
15K
100K
A1 709
C1 .02 µF
DISCRIM. VOLTAGE
12K
12K
A2 709
6.8K
D1 IN457
D2 IN457
2.2K
C2 50
Q3 2N3708
12K
D3 8.6V
6.8K
6.8K
A3 709
+15V
Q1 2N3053
10K
1.2K
CK1122 RAYSISTOR
180 1W
Q2 2N2646A
.001
AUDIO OUT
51Ω
B +15V AFTER TRANSMISSION COMPLETE
33K
+15V
6.8K
Q6 2N3708
1K
Q5 2N2646A
10
6.8K
51Ω
470K
IN457
33K
Q7 2N3708
33K
6.8K
6.8K
Q9 2N2646A
1K
470K
51Ω
10
10K
Q8 2N3708
20K
Q4 2N3708
.1
IN457
10K
C +15V DURING CW ID
A +15V DURING RECEIVER UNSQUELCHED CONDITION
OP AMP DETAIL
+15V
-15V
4
11
8
709
10
9
5
12
3
200 pF
.005
1.5K
7
1
709 TOP
8
14

Fig. 1. Off-frequency tone generator.

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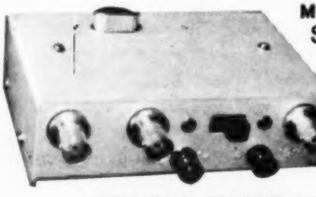

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to the base of Q4 causes it to conduct, shorting the emitter of unijunction Q2 to ground and preventing it from oscillating. As soon as the receiver no longer hears a signal, Q4 shuts off and allows Q2 to oscillate. During the repeater tail period, then, the tone is transmitted back. As soon as the repeater transmitter is unkeyed, a positive voltage (B) applied to Q3 causes it to conduct, discharging C2. C2 must be discharged in this way because of the high input resistance of A3.

The remaining circuitry comprising Q5 through Q9 is a "timeout" control circuit which disables the zero beater after 15 seconds of repeater use and reenables it after the repeater has been idle for 15 seconds or more. Q6 and Q7 form a flip-flop which is set or reset by Q5 and Q9. Both Q5 and Q9 are 15-second timer circuits.

Steering control for the flip-flop is accomplished by Q8, which shorts out the timing capacitor of Q9 when the repeater is in use. After the repeater has been in use for 15 seconds or more, Q5 completes its timing cycle and discharges the 10 μF timing capacitor into Q6, setting the flip-flop. Then the collector of Q7 goes positive, and the positive voltage coupled to the base of Q3 causes it to conduct, shorting the input of A3 to ground and disabling the zero beater.

When the repeater is inactive, point A goes to ground, Q8 is turned off, unshorting Q9's timing capacitor, and Q9 begins its timing cycle. After 15 seconds, Q9 discharges into Q7, resetting the flip-flop and enabling the zero beater.

External Connections

As shown in Fig. 1, the external connections required are power, discriminator voltage, audio output, and three control voltages. The control voltages are connected to points A, B, and C on the schematic, with the conditions shown. The inactive state of all three signals is ground. In the WA1KFY repeater, the CW identification function is self-completing; in other words, the repeater stays on until the ident has completed. It is necessary to inhibit the zero beat during the ID; otherwise both will play at once. This repeater uses solid-state logic for its control functions; however, the required signals (A, B, and C) may be derived from the COR of a relay-controlled repeater.

Summary

The zero beater provides everyone using the repeater with a continued frequency check. It has proved to be a very effective and useful device. The tone reaches its highest frequency when the input error is approximately 3 kHz or greater. If the error is less than 1 kHz, no output is generated. Since the device uses the receiver's discriminator output, it is important that the repeater receiver's frequency be accurate and stable.

Other uses for the device readily suggest themselves; for example, limiter voltage could be monitored, and the tone would then indicate signal strength. It could also be used as an alarm. In either case, A2 could be eliminated along with D1 and D2, since the input polarity would not change.

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HEP

73 will be presenting a series of simple IC projects. This initial article serves as the introduction by describing the "basics" of IC convention and nomenclature.

Integrated circuits are here to stay and the next few years will show a massive transition in industry and consumer products to complete integration. Based on this assumption, this article has been prepared for the amateur as well as professional user of integrated circuits (ICs). It includes tips on wiring, soldering, cross referencing, and simple projects using the ICs contained in the Motorola HEP kits.

A lengthy discussion of IC construction will not be covered in detail, as this information can be found in many IC textbooks. However, in order to be better able to know the advantages and limitations of those microcircuits, the reader should know what is contained in the basic IC and how these devices differ from other solid-state components.

As the name implies, an integrated circuit is a collection of many different components. The quantity and types of components vary from one IC configuration to another. A particular IC could contain active components (transistors, diodes) and passive components (resistors, capacitors). If all the components of the circuit are contained on the same "chip" or substrate, the unit is said to be "monolithic" (single crystal). The monolithic type is the most common and the least expensive to build. Other construction types are: thin film, thick film, hybrid, multichip. A discussion of these types can be found in almost any book that deals with the subject of ICs.

As an illustration of the extreme size reduction possible with integrated circuits, consider the Motorola 4-bit memory core, which contains 524 different components on a chip 50 x 70 mils. The average IC is much smaller, usually 40 mils square (1 mil = .001 in.). As the above example indicates, the race is on to see how much circuitry can be crowded into the smallest space. This effort is known in the trade as LSI (large-scale integration). Manufacturers are already starting to produce ICs that contain FET tunnel diodes, and even power transistors!

It is unfortunate, but many people are resisting the changeover from discrete (individual) components to ICs. This resistance could largely be due to the fact that people tend to shy away from circuits they are not familiar with.

The advantages of ICs over discrete components greatly outweigh the disadvantages. Size and weight reduction are obvious advantages but cost savings should also be considered. Consider the HEP 583, which contains 21 transistors and 27 resistors. If you had to buy all these parts individually and build this unit using a breadboard or printed circuit board you would indeed feel the pinch on both your pocketbook and your time. Other disadvantages that are not so obvious are as follows:

Repetition

If you need a circuit containing 20 J-K flip-flops, it would be a difficult task to build 20 of these, each containing 21 transistors and 27 resistors. This adds up to 420 transistors and 540 resistors! With ICs, only 20 TO-5 packages are necessary. Here is where cost, size, and time advantages come through again.

Repeatability

Because of the way ICs are constructed with components located in close proximity to each other, tolerances are much finer and parts are better matched, thus making up a device that functions as a complete unit. Power drain is lowered, there is less spurious noise pickup, and there is less noise generated within the unit.

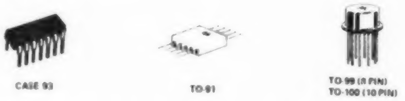

Fig. 1. Typical IC case styles.

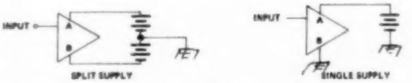

Fig. 2. The split supply contain four series batteries grounded at the connect point. Where possible to use, the single supply offers the advantage of simplicity.

Reliability

Many manufacturers are turning to ICs because of their high reliability. Devices built under almost clinical conditions are bound to be better than a circuit built on a workbench. As an example, consider building the electricaequivalent to the HEP 583, using the 21 transistors and 27 resistors: It would be necessary to make 80 to 90 solder connections, a real source for potential trouble.

In addition to the advantages listed, replacement is simple. Schematics are easy to read, especially for the beginner. Areas yet to be conquered in the construction of ICs are: How to built inductors, large-value capacitors, and high-value resistance on an IC chip. It is presently necessary to connect these components externally.

ICs can be mounted on perforated board or printed-circuit board by either soldering to terminals or using sockets. Sockets are definitely recommended, especially for the hobbyist who will, generally, use the IC over and over in different applications. Constant soldering and unsoldering of the leads weakens them and could cause the wires to be broken, or internal damage could result due to excessive heat from the solder iron.

The HEP 580 thru 583 (devices included a Motorola IC kit) are mW RTLs. This logic family is considered the easiest for the hobbyist, experimenter, and IC novice to "cut their teeth" on. The HEP 584, 570, 571, 572 are MRTLs – also a good family for the beginner. The HEP 553, 554, 556, 558 are ECLs – not the easier to work with, but the best logic family for high frequency and noise rejection.

IC Packaging

Integrated circuits can be found in a variety of packages. At the present time, there are more than 120 case types made by some 70 companies around the world. Of these many case styles, three types are dominant. (In terms of quantity of devices on the market, in a given case type, about 90% of their quantity can be found in some variation of one of these three case types). As yet, no definite standardization has been set up among the manufacturers regarding packaging, pin numbers, and locations, so carefully check the basing before you plug that IC into the socket. Three popular case styles are pictures in Fig. 1.

Use a low-wattage soldering iron! 25 to 40 watts is a good range. Excess heat could "kill" the IC.

Keep component leads short! Excess lead length could cause spurious or parasitic oscillations or no operation at all.

If you are using a power supply (other than a battery), it is a good idea to bypass the power leads. Connect a 0.05 or 0.1 capacitor from the power input to ground at or near the input terminal of the IC.

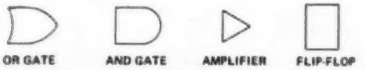

Fig. 3. Four basic logic element configurations used in IC diagrams.

Power Supplies

For projects using 1 or 2 ICs, batteries are usually the best supply. On larger projects, an ac supply is better. The power supply requirements for the various logic functions have been standardized as follows:

RTL	3AV ± 10% (2.6 to 3.3V) and 3.6 ± 10% (3.24 to 3.96V)
MwRTL	3V ± 10% (2.6 to 3.3V) and 3.6 ± 10% (3.24 to 3.96V)
DTL	4V ± 10% (3.6 to 4.4V)
MDTL	5V ± 10% (4.5 - 5.5V)
VTL	±4V to ±10V (8 - 20V)
ECL	5.2V ± 10% (4.5 - 5.5V)
TTL	5V ± 10% (4.5 - 5.5V)
HTL	18V

Obviously, batteries in some of these odd voltage ranges are not available: however, experimentation has categories as follows: many of the devices were found to work well from 1.5 to 12 V! *Very few* did not – but after all, they are only rated from 2.6 to 4V (approximately). This makes it possible to use many of these ICs over a wide voltage range. Usually an IC rated at 3.2V minimum works well on 3V and one rated at 5.5V maximum works at 6V.

ICs can be connected in one of two ways, using one or two supplies. The dual or split supply is most common in linear circuits. The two supplies are shown in Fig. 2.

There are some applications where the split supply is advantageous but generally it involves more complicated circuitry. The novice in ICs is likely to be a novice in the area of computer logic also. The logic symbols are to digital ICs what schematic symbols are to resistors, capacitors, etc. Some of the more common types are shown in Feb. 3. These symbols have recently been standardized by the government. Before that time, each manufacturer had his own set of symbols.

Basic Logic Types

Most computers work on the binary principle. Binary stands for "two",– two states or conditions, which are either *on* or *off, high* or *low* or *1* and *0.*) Consider the condition where we have zero or near zero volts at the input to a gate, flip-flop, amplifier, etc; with positive logic it is an *off* condition. If this voltage goes positive, let's say to 1 or 2V, it is now in an *on* condition.

The common functions in digital ICs are:

- Gates - control the passage of signals.
- Buffer - amplifies power of signals to be able to drive more units.
- Inverter – reverses the logic from + to - or - to +.
- Expander – affords additional inputs to a gate.

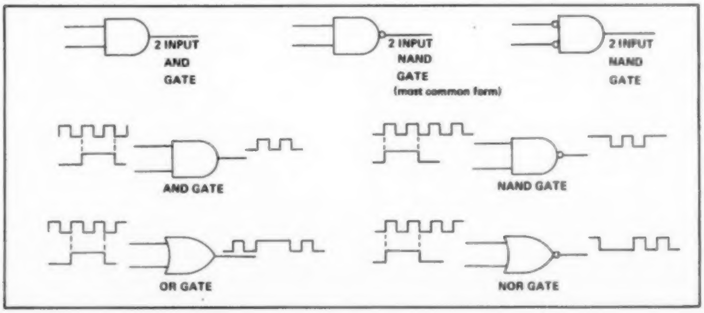

Fig. 4. Basic gates with their input/output waveforms.

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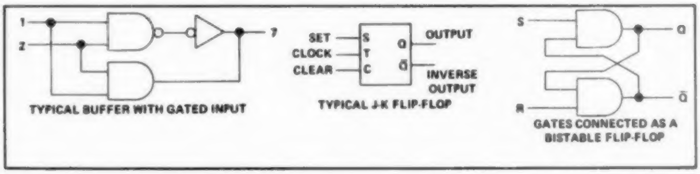

Fig. 5. Basic amplifier and flip-flop configurations.

- Adder – provides the *summ* and *carry* operations on two input signals.
- Shift Registers – provides bistable storage.
- Flip-flop - provides division or *count*. One flip-flop divides by 2, provides one output change in state for every two input charges.

Gates. This function comes in a wide variety of configurations. There are 2, 3, 4, or more inputs and 4 categories as follows:

- *And:* When all inputs go to 1, output will go to 1.
- *Nand:* Output will be 1 except when all inputs go to 1.
- *Or:* When any input goes to 1, output will be 1.
- *Nor:* Output will be 1 except when any input goes to 1.

Nand and *nor* differ from *and* and *or* in that inversion has taken place. Refer to Fig. 4. Note the small o at the input or output of some of the examples. This o indicates that inversion has taken place.

Gates can be connected to operate in a wide variety of applications other than those for which they were designed. Some applications are free-running multivibrators, bistable, one-shot, amplifiers, and audio mixers.

Occasionally the time arises when the hobbyist needs something in the way of gates other than what he has or what is available. For example, you need a 3-input gate and you have a 4-input gate; simply ground one input. Ground two inputs to obtain a 2-input gate. If you have a dual 2-input gate, such as the HEP 580, and you need a 4-input gate, tie pins 6 and 7 together and this becomes the output; inputs are then on pins 1, 2, 3, and 5.

Amplifiers. In digital work it is referred to as a buffer. Its original use is to increase "fan-in" or "fan-out" capability; that is, the number of other units that can be connected in parallel to the input (fan-in) or output (fan-out). By adding proper external biasing it is possible to connect this unit to linear (audio-rf) usage.

Flip-Flop. There are a number of types of flip-flops available. As mentioned previously, a flip-flop (multivibrator) can be "made up" by cross connecting two gates. The R-S flip-flop is one example. The J-K flip-flop is similar but has the added function known as "clock input" shown as "T" on the logic block of Fig. 5.

Fundamentally, flip-flops divide by two. By proper connection, division by 3, 4, 5, etc. can be obtained using a few ICs as shown in Fig. 6.

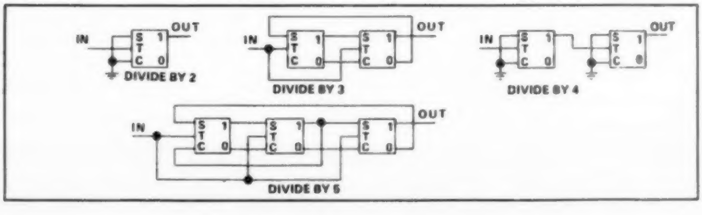

Fig. 6. Flip-flops connected as dividers.

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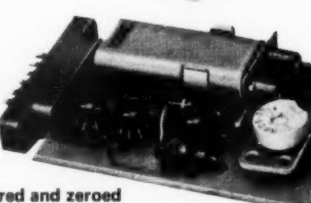

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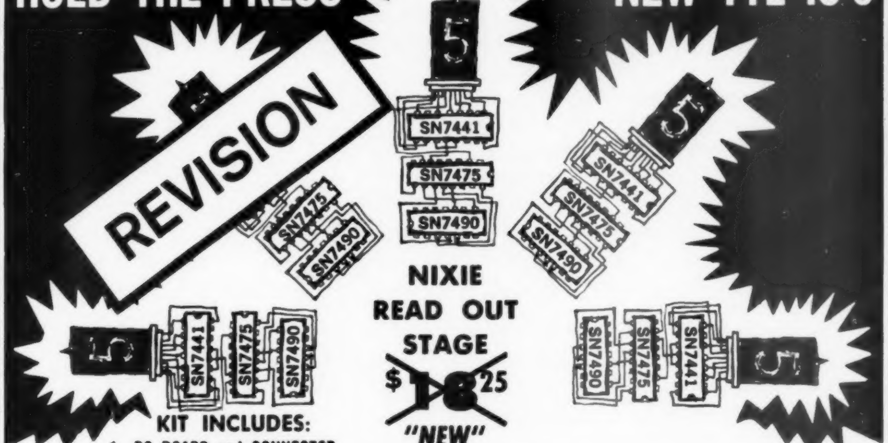

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Voices from the PAST ...

50 YEARS AGO

AMATEUR RADIO

Amateur radio operators virtually beat the sun across the continent during the recent daylight tests when a message starting promptly at dawn on the East coast, reached Los Angeles, Cal., before the sun appeared above the Pacific horizon. Favorable transmitting conditions were met which made the trans-continental trip possible in one hour and twenty-five minutes with but two relays.

An early start clinched the laurels for D. McR. Parsley, operator of amateur station 4FT at Wilmington, N. C. It left Wilmington at 6:15 A.M., Eastern Standard Time, and reached Los Angeles at 4:40 A.M., Pacific Standard Time. The message read: "Are you all set for the Transpacific tests? Answer at once." After being relayed by amateur stations 5PB and 6AWT, it was received by B. Sano, of 855 S. Birch Street, Los Angeles

Ten messages were started from either coast and according to the incomplete logs that have arrived at the League headquarters, many of these dropped by the wayside on account of the necessity for constant relaying under unfavorable daylight conditions. Several hundred amateurs participated in the tests. One message starting from the East coast read: "A drop of the Atlantic ocean goes with this message; return with the salt of the Pacific."

Salinas, California, is reported by W6CLV to be an isolated 112–224 megacycle area. On his monthly trek to S.F., he found that W6PIO Alameda, W6TFZ PNQ San Francisco and W6PYH Oakland are new – at least to him.

W6QLZ says that his 2½ meter signals seem to have less fading than 5 (but are received on a converter with superregen detector at OVK so there is some a.v.c. action present). Clyde is trying to get W3HJQ/6 up before daylight for dx schedules because signals are good then even when they are only 50 percent in the evening. This phenomenon is familiar to many who have had experience with low atmosphere bending.

30 YEARS AGO

RADIO

At luncheon in April, W4EDD made the observation that during his travels he has found that the majority of hams interested in 112 megacycles are relatively new at it – for which reason the majority of articles about 2½ meter equipment should be elementary "how to build it" stories about relatively inexpensive equipment. How about grinding out a few, fellows, to help out the newcomers?

10 YEARS AGO

73

The production of a new and strange kind of variable capacitor recently came to the attention of the writer. This capacitor takes the form of a semiconductor, is about the size of a germanium diode, and is available in sizes from 7 to 100 mmfd. The strange thing about this little gadget is that the capacity is a function of a dc bias voltage impressed across it. The manufacturer, Pacific Semiconductors Inc., Culver City, California, use a standard voltage of four volts as the 100% capacity rating point. It may be seen from the curve in Fig. 1 that at zero voltage the capacity is about 250% and at 100 volts the capacity has dropped to 20% of the 4 volt value. *Caution:* A reverse polarity voltage should never be used and any superimposed ac peak must not go on the other side of zero.

As soon as you get the full import of the above you begin to get ideas. The "Varicap," for such is its trade name, has many possibilities. The first one the writer thought of was an FM modulator.

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BASICS of SURPLUS FM

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Electrically, the FM base station is exactly the same as a mobile, except for the power supply. Usually, the transmitter and receiver "strips" are absolutely identical in the mobile and base version of the same series.

Physically, the base station can come in many forms. First of all, the common desk model is quite popular. This may be the best version for the ham because some desk models have an external mike gain control, modulation meter, and built-in clock. Rigs such as the trunk mounted mobile may have only a volume, squelch, on-off and channel switch.

You can either have the controls right on the unit itself or have a remote control head at the operating desk. Still another type of base station is the type mounted in the weather-proof housing. This is really nothing but an outdoor relay-rack type panel. At some sites, the whole station is located a couple of hundred feet up the tower in this type of housing. This is ideal for the remote transmitter-receiver or repeater type setup. (I'd like to see someone do this with their KWM-2).

Since base stations are more scarce than mobiles, you can figure on paying about 25% more than the identical mobile for your base. It's a simple case of product in demand.

Since FM operates on fixed channels, being on frequency is especially important. Crystal controlled receiving, as well as transmitting equipment, is the key to this reliability.

Let's now say that we have a crystal controlled transmitter and receiver. Good... now we have half the battle licked. As you may or may not know, the frequency at which the crystal operates depends on the load capacitance of the input of the oscillator. When ordering crystals, be sure to get one which is designed especially for your oscillator's capacitance. If the capacitances are not matched, you will be off frequency. There is a good side to this story, however. In just about all commercial FM rigs, you will find a small ceramic trimmer either in parallel or series with the crystal. This "rubbering" capacitor is used to get you *exactly* on frequency. To tune the transmitter to the frequency, you need a receiving station with a 50-0-50 μa meter plugged into the discriminator jack. If you know that the receiving station is on frequency, simply turn the "rubbering" capacitor until the receiving station indicates that his meter reads zero. You do this while transmitting with no modulation. For tuning an off frequency receiver with an on frequency transmitter, the procedure is the same, but you read the receiver's meter while turning the receiver's capacitor.

Crystal ovens are often used on FM. The purpose of an oven is to keep the crystal at a constant temperature to keep it always on frequency. With an oven, even on the coldest mornings, you will be exactly on frequency within a matter of minutes. These ovens have a single temperature between 60° and 85°C in which the crystal is placed. The ovens usually come in either one or two crystal models. When using ovens, be sure that the crystal is designed for that temperature. Used ovens run between $1.00 and $3.50, but sometimes surplus rigs come with them.

You must use very high quality crystals. Don't even consider using surplus. The prices usually run between $4 and $7 for a .0025% crystal. These crystals are also made to order. When ordering, specify holder type, load capacity, oven temperature (if used), crystal frequency and formula as well as operating frequency, afc or non-afc circuit, and radio model number. In any event, you can never include too much information.

When changing frequencies with these commercial rigs it is not just a simple case of having all the crystals go to one rotary switch and then to the oscillator. Since being on frequency is of the utmost importance, a separate oscillator and "rubbering" capacitor is provided for *each* crystal. Many rigs use just one half of a 12AT7, for example, for one frequency, then switch cathode circuits to use the other half for the other frequency. However, with most rigs the most frequencies you can normally have is two frequencies transmit and two frequencies receive. To go through a repeater, you will normally need one frequency for receiving and two frequencies for transmitting. In some areas, however, the repeater output is not located on the main channel and you may need two frequencies for receiving also.

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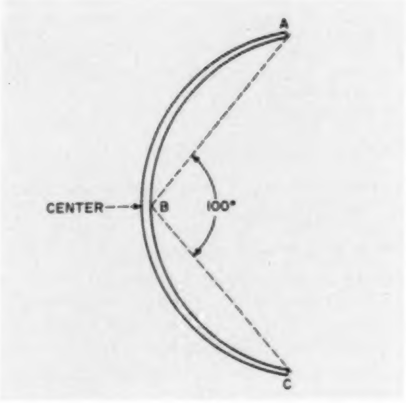

Fig. 1. The curve should be kept uniform.

Figure 2 shows another piece of aluminum tubing bolted at right angles to the original tubing (ABC). This additional tubing is identical to that shown in Fig. 1 and is shown as a straight line (DBE). The aluminum shown in DBE in Fig. 2 is actually bent into the same configuration as tubing ABC of Fig. 1. Bare copper wire is used to strengthen the elements ABC and DBE as shown in Fig. 2. Also, this wire is needed to support the aluminum sheet metal shown in Fig. 3.

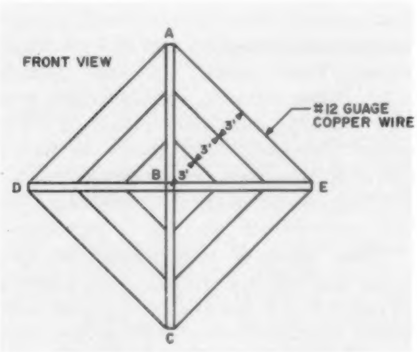

Fig. 2. Copper wire forms the basic framework.

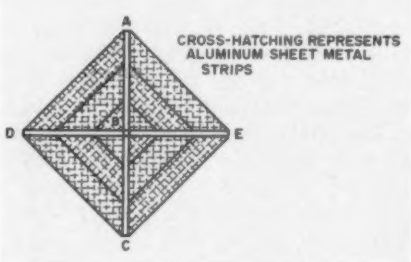

Fig. 3. With the addition of shaped sheets of aluminum, the dish begins to look like an antenna.

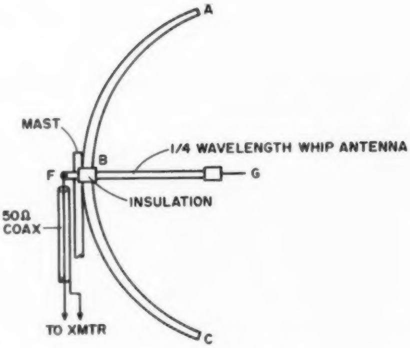

Fig. 4. The driven element can be any good-quality quarter-wave whip. Keep the whip insulated from the reflector and feed it with 50Ω line.

The sheet metal shown in Fig. 3 is approximately 0.04 in. thick. You will need a roll about 80 ft long. This will act as a giant reflector element giving the antenna a 40 dB front-to-back ratio.

Figure 4 shows the driven element FG. This may be any good quality vertical antenna such as the hustler series by Newtronics. It must be resonant on 10, 15, or 20 meters. (Aluminum rod DBE of Figs. 2 and 3 is not shown in Fig. 4.) The driven element (FG) must be insulated from the rest of the antenna system. This may be done with plastic sheets and tape. The driven element (FG) should be kept at least ¼ in. away from the rest of the system at point B of Fig. 4. The antenna is fed with standard 52Ω coax cable. The feedpoint (F) should be bolted and taped carefully. The shield of the coax should be connected to a nonrotating portion of the reflecting segment of the antenna system. Forward gain will vary anywhere from 14 to 25 dB depending on the type of driven element used and the frequency band it is used on. Generally, the higher frequency bands (10 and 15 meters) will deliver improved performance. The dimensions given for the reflecting portion of the antenna may be the same for each band.

Good DX results have been obtained with this antenna with low power and a tower only 20 ft high.

. . .WA2SJZ■

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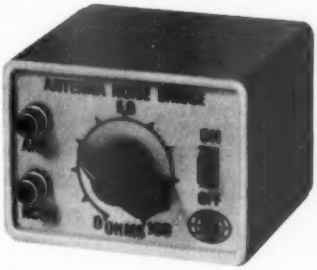

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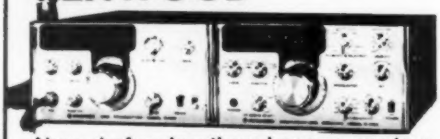

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The Galaxy FM 210

OFF
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FM 210

If you ever had any doubts that FM as a mode for amateur operation was here to stay, you may quietly put that doubt to rest forever. A quick glance at the advertisements and articles in the amateur magazines should show you the impact that VHF FM operation is having on ham radio today. There are many concerns that are selling used police and taxi two-way gear and a number of small and large equipment manufacturers that are making gear strictly for amateur use. Until recently the only ready-made gear available for VHF FM operation was the stuff manufactured by the commercial and public safety two-way radio companies: Motorola, GE, RCA, Kaar, and a dozen or more others. Bargains were and still are commonplace in second-hand gear that has been retired from commercial service. But much of this gear is ten years or more old, designed with vacuum tubes, powered by dynamotors, and strictly for mobile use. Some conversion is necessary for amateur use, depending on what frequency you are going to use and whether or not you plan to use it in your car.

Now, however, there are a number of completely transistorized units on the market, *designed solely for amateur use,* fully wired and ready to plug in and operate. Generally, these units have been of Japanese manufacture, designed for FM operation on 2 meters, running somewhere between 1 and 10 watts output. Most cost $250 or more, but are selling quite well nonetheless. *Galaxy Electronics* has not only come out with a 2 meter FM transceiver that has features similar to the Japanese-made units on the market, but has incorporated the best feature of all, as far as Japanese electronic equipment is concerned: low price. *Galaxy* has beaten the transistor technology of Tokyo at its own game by undercutting the price of even the *least* expensive Japanese rig by $50. And mind you, the FM-210 is all-American, parts and labor.

The FM-210 has a trim and deceptively simple look to it. It almost looks more like a control head than a complete transceiver. On the front panel there are concentric controls for off-on-volume and squelch, receive channel, and transmit channel. Also there is a pilot lamp and mike jack for PTT hi-Z mike. To open up the unit, all you have to do is remove four sheet-metal screws on the bottom of the case and slide the entire chassis out of the cabinet. The cabinet, incidentally, is very rugged, being made of very heavy gage metal.

Inside, you find four printed circuit boards and some chassis-mounted wiring. One board is the front end and first mixer, another the i-f section and detector, a little one in the back is receiver audio, and the last board contains transmitter audio, oscillator–doubler, doubler, and the varicap modulator. Another doubler, the driver, and power amplifier are mounted on the chassis proper. Mounted on the back wall is a heavy duty T/R relay, antenna connector, and power plug.

The final transistor, by the way, has a separate power lead for its collector supply running to the power plug. That's so you can run 28V on the final collector for extra power. In fact, that's what is done in the AC-210 power supply for fixed station (or mobile) use. The AC-210 is available as an accessory for $40. The transceiver requires 14–16V dc for power, but works nicely on a 12V storage battery. If you plan to use the FM-210 primarily for fixed use, you could build your own ac supply, or better yet, get an old storage battery to power the rig. That way, you still have a rig on the air during a power failure. For mobile use, however, that 16V rating is very comforting, especially if you're not sure exactly how much voltage is coming out of your car's generator or alternator.

Receiver Section

The receiver section starts with a 2N5485 FET rf amplifier feeding another 2N5485 operating as the first mixer. A third and fourth 2N5485 serve as oscillator and tripler to drive the mixer. A third and fourth 2N5485 serve as oscillator and tripler to drive the mixer. From the mixer the incoming signal is fed to a 2N3855 i-f amplifier operating at 10.7 MHz. Then, the signal is heterodyned by a 2N3855 mixer down to 450 kHz. A 2N2926 is the crystal-controlled second oscillator. The signal is now fed into a 4-pole filter which is adjusted at the factory for optimum FM reception. The filter is used to provide the selectivity necessary to eliminate adjacent-channel QRM. After filtering, the signal is fed to a pair of 2N2926s, which provide the needed i-f gain to drive the limiters. Yes, there are TWO limiters!

Following the limiters is a novel fixed-tuned discriminator built around a Clevite ceramic resonant component. The detected audio is fed through two stages of amplification provided by another pair of 2N2926s and then to a 2N3638 audio driver and a D42C1-D43C1 matched "complementary pair" transistor output stage, which drives the built-in speaker.

According to the manufacturer, the receiver sensitivity is rated as 0.5 μV for 12 dB SINAD and 1.0 μV will give 20 dB quieting. At my QTH, with a homebrew groundplane about 25 feet in the air, I heard a mobile station in New York City, about 35 miles away. His signal was noisy, but Q5 nonetheless. And this was a "direct" signal – no repeater. Speaking of repeaters, I've been able to key up two different repeaters from my fixed location, and one of them from the car. All this with full-quieting signals at the repeater's receiver. Not bad for only a few watts, eh?

Transmitter Section

The transmitter section begins with a two-stage audio amplifier (a pair of 2N2926s) driving a 2N4916 clipper. There are controls on the printed circuit board for clipping depth (mike gain) and modulation deviation (clipper output level). Following the clipper, the audio is processed by an active filter. A 2N2926Y and a 2N4916 serve in the active filter section. Modulation of the transmitter is accomplished by an MV1628 varicap in series with the transmitter's crystal.

A single 2N3563 serves as the transmitter oscillator and first doubler, followed by a 2N3904 second doubler, 2N442 third doubler, 2N4427 driver, and a 2N5641 power amplifier. The final is rated for 10W output at frequencies up to 500 MHz, so you are not pushing it at all when you run the FM-210 on 12V. According to the instruction manual, the transmitter is tuned up for operation, with the crystals supplied, into a 50Ω resistive load. That means that you shouldn't have to touch anything inside the transmitter if you use a groundplane or coaxial type antenna and stay within a half megahertz or so from 146.94. The transmitter is fairly broadbanded: I can switch between 146.34 and 146.94 with no appreciable change in output.

Channel Selection

Channel selection for the three possible receive and three possible transmit frequencies is accomplished by two front-panel switches. Notice that there are two selectors: one for transmit, one for receive. This is a very flexible arrangement since it enables you to choose any combination of receive and transmit frequencies for which you have crystals. The FM operator will quite often transmit on a different frequency from the one on which he is receiving. This is the procedure when using an FM repeater, for example. For those times when your friendly local repeater is out of service, all you have to do is switch your transmit frequency to the repeater output channel and you are all set to operate "simplex." At this point, however, you will appreciate the value of a repeater, unless your QTH happens to be on top of a mountain. For strictly local contacts it's a good idea to operate simplex anyway, so that you won't tie up the repeater when you don't really need it. The extra receive frequencies are especially useful if you plan to operate mobile and do a lot of traveling to different cities; not all repeaters are set up to transmit on 146.94 – some are on 146.88 or 146.76. It all depends on what the local clubs have decided should be the proper channel for their particular area. And, too, some areas have several repeaters in service.

The FM-210 comes with crystals for transmitting and receiving on 146.94 MHz., the nationwide standard FM channel, so you should be able to talk to someone as soon as you wire up the power connector and hook the rig up to an antenna. However, I'm sure you will want to avail yourself of your local repeater, so find out what the input and output frequencies are and order the proper crystals.

The entire transceiver is very well constructed, and it is obvious that a good deal of thought has gone into the design of the rig, especially when you inspect the insides and look over the schematic. If your local dealer will let you, open it up and take a look at the guts of the thing! American-made components of good quality are used throughout and all rf transistors (except the final) are mounted in *sockets,* just in case you do something nasty to this fine little rig. Make sure, though, that all transistors are firmly seated in their respective sockets. They could loosen up in shipment or during excessively bumpy mobile operation. Layout of components is neat and very accessible, should service ever be needed.

The FM-210 is a fine little rig – at home both in the car and in the shack. Its only real limitation is its low power: over a long haul, you'll have a rough time of it. Most of the boys with commercial gear are running at least 30W or more. And that's 30W output. But for local QSOs and contacts through a repeater, the FM-210 can't be beat.

One final note: each of the dozen or so hams to whom I have shown the intruction manual for the FM-210 has been very impressed with the quality of the book: it is easy to read, indexed, spiral bound to lie flat, and tells everything you need to know – even where to order crystals. And the schematic is very large. It's a foldout about three feet long, clearly drawn, and easy to read. You have to see it to appreciate it.

. . .K2ULR■

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PT preamp	49
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TX-62 VHF Xmtr	**99**

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381 TR switch	19
424 low-pass	9

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FCC-90B 100kc cal	$ 12

CENTRAL ELECT.	
QT-1 Anti-trip	$ 9
Model B slicer	39
GC-1 compreamp	34
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32S-3 Xmtr	575
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351D-2 mount	79
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516E-2 DC (28v)	95
MP-1 DC supply	119

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2BQ spkr Q-mult.	29
2C Receiver	189
2CQ spkr Q-mult.	34
SW-4A Receiver	225
R-4 Receiver	275
R-4A Receiver	299
MS-3 speaker	12
SC-6 6m converter	49
CC-1 conv.console	19
TR-3 Transceiver	375
DC-3 DC supply	75
T-4 Reciter	225
MN-2000 matcher	149
TC-6 xmit.conv.	189

EICO	
730 Modulator	$ 39
753 SSB Xcvr	129
751 AC supply	49

ELDICO	
TFP-1 patch	$ 25
SSB-1000 Linear	175

ELMAC	
PMR-7 Receiver	$ 59
PMR-8 Receiver	79
PSR-612 DC supply	19

GLOBE/GALAXY/WRL	
Scout Deluxe xmtr	$ 49
LA-1 Lin. Xmtr	69
King 500A Xmtr	199
SB-175 SSB Xmtr	59
V-10 VFO	29
Galaxy III Xcvr	169
Galaxy V Mk II	269
Galaxy V Mk III	289
GT-550 Xcvr	349
AC-35 AC supply	65
AC-400 AC supply	75
RV-550 Rem. VFO	69
RX-1 Remote VFO	49
VX-35 VOX	9
VX-35C VOX	12
CAL-35 Calibrator	9
SC-35 Speaker	15
SC-550 Speaker	19
2000 Linear-sup	275
Duo-Bander Xcvr	99
Rejector AC supply	4

GONSET	
Comm I 6m	$ 79
Comm III 6m	99
GC-105 2m Xcvr	169
2m Linear II	99
901A AC supply	39
910A 6m Xcvr	199
911A AC supply	39
913A 6m Linear	175
G-76 Transceiver	**99**
G-76 AC supply	75
G-76 DC supply	49
G-77 Transmitter	45
GSB-100 Xmtr	169
Super 12	19

HALLICRAFTERS	
S-38D Receiver	$ 34
SX-88 Receiver	389
SX-117 Receiver	199
S-200 Receiver	49
SX-130 Receiver	149
SX-146 Receiver	**189**
R-46 Speaker	9
R-50 Speaker	12
HT-32 Xmtr	225
HT-32A Xmtr	249
HT-33A Linear	275
HT-37 Xmtr	199
HT-46 Xmtr	275
SR-150 Xcvr	289
PS-150-120 AC sup	75
MR-150 rack	19
SR-500 Xcvr	225
P-500AC AC sup	75
HA-4 Keyer	39

HAMMARLUND	
HQ-100 Receiver	$ 99
HQ-100C Receiver	109
HQ-100AC Rec	139
HQ-110 Receiver	119
HQ-110C Receiver	129
HQ-110AC Rec	169
HQ-170C Receiver	179
HQ-170A Receiver	229
HQ-170AC Rec	239
HQ-170A immunizer	259
HQ-180 Receiver	239
HQ-180AC Rec	349
SP-600JX-26 (rack mt.) Receiver	275
S-100 Speaker	12
S-200 Speaker	15
HX-500 Xmtr	225
HXL-1 Linear	175
HK-1B Keyer	19
Noise Silencer	19

HEATHKIT	
GR-64 Receiver	$ 39
HR-20 Receiver	89
RX-1 Receiver	149
SB-300 Receiver	225
SB-301 Receiver	249
XC-2 2m conv.	25
XC-6 6m conv.	25
SBA-300-3 6m conv.	19
SBA-400-4 2m conv.	19
TX-1 Transmitter	115
HX-10 Transmitter	189
HA-10 Linear	175
HA-20 6m Linear	95
HW-32 20m Xcvr	89
HP-24 AC supply	50
VF-1 VFO	19
HW-29A (Six'er)	34
VHF-1 (Seneca)	139
HRA-10-1 Calibrator	9
HW-18-3 160m Xcvr	119

HEWLETT-PACKARD	
410BR rk. mt. VTVM	$150

HICKOCK	
Cardomatic Tube Tester	$175

HUNTER	
1000A Linear sup	$199
2000A Linear	299

ICE (as-is)	
ICE-1 2m Xcvr	**$ 75**

JOHNSON	
122 VFO	$ 19
Ranger I	89
Valiant I	139
Valiant II	189
SSB Adaptor	175
Pacemaker	149
Invader 200	225
275w Matchbox/SWR	69
6N2 VHF Xmtr	85
TR switch	19
Signal Sentry	9
100kc Calibrator	9

KNIGHT	
T-150A Xmtr	$ 69
TR-106 6m Xcvr	89
T-175 6/10m Linear	69

LAFAYETTE	
HE-62 10m VFO	$ 19
HA-90 VFO	19
HE-50A 10m Xcvr	59
HA-500 Receiver	69

MILLEN	
90651A GDO	$ 75

NATIONAL	
NC-125 Receiver	$ 79
NC-303 Receiver	239
XCU-300 calibrator	9
NCX-3 Xcvr	169
NCXA AC supply	75
VX-501 Remote VFO	125
200 Transceiver	239
AC-200 AC supply	59
NCX-500 Xcvr	299
HRO-500TS spkr.	30

OMEGA-T	
TE7-01 noise bridge	$15

P & H	
LA-400C Linear	$ 99

PARKS	
50-1 6m Conv.	$ 15

POLYTRONICS	
PC-6 6m Xcvr	$149

SIDEBAND ENGINEERS	
SB-33 Transceiver	**$179**
SB1-DCP Inverter	29
SB2-DCP Inverter	35
SB1-LA Linear	159
SB-34 Transceiver	**279**
SB2-VOX	19
SB3-XC Calibrator	15
SB2-MIC Mike	9

SWAN	
SW-117 AC supply	$ 65
SW-240 Xcvr (late)	169
400 Transceiver	**189**
406B VFO	50
410 VFO	75
420 VFO	95
VX-1 VOX	15
350 Xcvr (late)	289
500 Transceiver	349
500C Xcvr	389
117XC AC supply	80
NS-1 noise silencer	24
405X MARS osc.	29
250 6m Xcvr	239
250C 6m Xcvr	339
TV-2 2m Transverter (specify 14 or 50)	225
FP-1 phone patch	34

U. S. C.	
Z-200A Digital V M	$85
Z-200A (rk. mt.)	75

UTICA	
650 6m Xcvr VFO	$ 89
650A 6m Xcvr VFO	99

WATERS	
369A Reflectometer	$75
361 Codax keyer	49

The items listed below are brand-new and carry the full manufacturers New Equipment Warranty. Some items have been on display but most are Factory Sealed.

ND = New Display FS = Factory Sealed

BTI		Reg	NOW
LK-2000HD Linear	ND	$895	$695

EICO		Reg	NOW
751 AC supply kit	FS	$ 89	$ 54
751 AC supply wired	FS	109	79
752 DC supply kit	FS	89	49
752 DC supply wired	FS	109	75
HFT 92K AM FM Tuner kit	FS	64	39

SIGNAL/ONE		Reg.	NOW
CX-7 Transceiver	ND	$2195	$1750

SWAN		Reg	NOW
410C Remote VFO for 500C	FS	$115	$100
405 MARS osc. for 350 500	FS	45	35
TV-2 2m Xmit conv.	FS	295	225
260 Transceiver	FS	435	369
350C Xcvr (no supply)	FS	420	370

VARITRONICS — New Close-out	Reg	Now
FDFM-2 12vdc 2m FM Xcvr (5 watts input) with BP-1 Battery Pak	$262	$199
FM20M Mobile Linear for above	150	89
FM20BM Base Linear & AC supply	235	125

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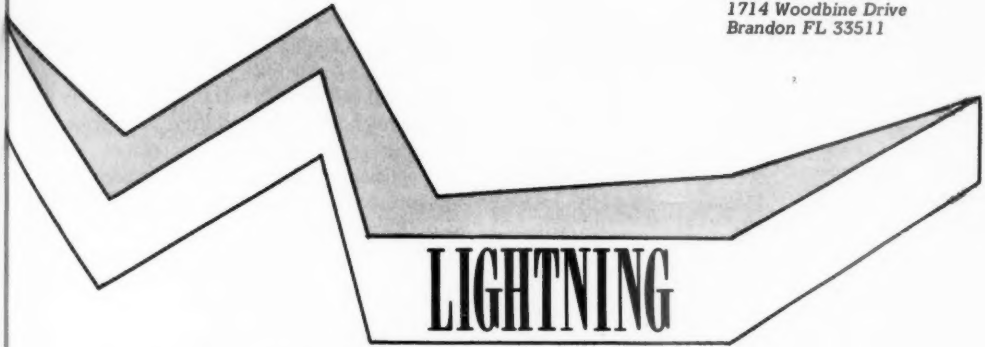

LIGHTNING

As It Affects Ham Radio

Back during the war, when the inventive German mind was finding front line uses for amplifiers in telephony work, with two wires inserted into the earth some 200 feet apart, an enemy operator listened to Allied telephone messages by amplifying the small induced currents in the earth picked up by the wires. No record exists of how effective the means of spying turned out to be except that the operator heard curious whistles and wanted to know where they came from. The whistle was found to be caused by the lightning in a storm, or lightning not necessarily associated with a storm. This led to the discovery that at any instant there are about 1800 lightning storms on the globe.

We live in an area where the frequency of lightning storms is very great compared to the "average" location. Some 90 of the 360 days per year may find thunderstorms in the area.

What, then should we do? Let's turn to the insurance companies and the electrical code to find some answers and back to Benjamin Franklin to find others. If you research any particular project you will find that the basic physics and chemistry were well known a hundred years ago but the hardware may not have been readily available to the average person at that time.

In 1752 printer B. Franklin wrote many letters in regard to the properties of lightning, and the greater share of the buildings in Philadelphia were protected by the rod he "invented" and improved. There was some discussion in the scientific circles of the day regarding the use of a point on the rod versus a simple overhead protective wire such as the power companies use today. One school of thought held that the pointed rod would actually cause lightning strokes more often than the spherical terminal would, yet the spherical would offer the same protection in case of a stroke.

The power companies have found that if ground wires are kept above the "hot" lines, there is a protective factor involved. As a proof that this is not always effective, GE puts out a gadget we should all have on the service entrance to the house. It is a lightning arrestor costing about $8, available from the local electric supply house. It is intended to prevent a stroke which hits the lines and causes a "bump" in voltage to pass down the lines from entering your home. This protects all the equipment you have plugged into the outlets and also the lighting you have in the home.

First, let's talk about the destructive effects of lightning. If it strikes a tree, the current through the tree may cause the temperature of the sap to go to 27,000 degrees. This, of course, destroys the tree because the steam cannot escape fast enough to the atmosphere – so it "blows" the tree, or maybe just the bark. The same happens in a building where the reinforcing rods do not have electrical connection; the lightning jumps the gap and causes steam to be emitted which causes great damage to the particular portion that gets hot.

There is another peculiarity we should be cognizant of: If you have a rubber-covered 14-gage wire on the antenna lead-in, the copper may be completely disintegrated, and the rubber not destroyed. This has been observed and also investigated in the laboratory. Knowlton, writing in the Handbook for Electrical Engineers, says high current peaks may shatter trees without setting fire to them, while a succession of the current peaks may well cause a fire. High-current short-time discharges passed through a 14-gage rubber-covered wire can eliminate the wire but leave the rubber apparently undamaged. Hollow or flat conductors may be crushed by high lightning currents owing to both heating and magnetic effects.

Other authors speak of the magnetic effects and the distortion to the point of disintegrating circular conductors such as pipes. Again to Knowlton – the largest conductor known to have completely burned through by a stroke is a 4-gage solid copper conductor. He is speaking of the ground wire over a power line used to intercept the stroke and to conduct its current to ground without sufficient potential developing to cause a flashover between the ground wire or tower and the conductors.

The Britannica offers several interesting comments:

1. Experiments on power lines at high altitudes suggest that if we were at an altitude of 18,000 to 20,000 ft, we would not have any strokes of lightning taking place. The 100 kV line from Denver to Argentine pass (1 mile to 13,500 ft) was found to have much less lightning stroke current as altitude increased.
2. Strokes seen but not heard: With an upward initial leader stroke, not followed by downward leader current peaks, the rate of rise and decay of current may be slow enough so that the sound of thunder is not heard. On this basis thunderless strokes would only occur on high buildings.
3. Persons struck by lightning have been revived by artificial respiration. The result of being struck is electric shock and burns, or both.
4. Trailing antennas from planes is likely to increase the possibility of a stroke, and antennas pulled by planes are sometimes destroyed by lightning.

Suppose you have a tower on the top of your home and you want to protect yourself. What now?

Using the above references and others, the following list was compiled.

1. Place a GE protector on the incoming power line at the service entrance. Cost is $8.
2. Find two points in which to connect the down wires to ground, such as a metal waterpipe. Dig up these two locations and determine that the pipe is metal and in suitable condition to connect the wires to them. They should be on opposite sides or ends of the home. If pipe is not available, ground rods must be driven. These should be 5/8 in. copper-coated.
3. Use 4-gage stranded copper wire for the down wires. Cost is about $20 per 100 feet.
4. The best installation will have at least two down conductors and they will be at opposite ends of the building to be protected. This provides an overhead wire that will umbrella the whole house.
5. String the down wire along the house and bring it down so that the current will take the most direct path to ground possible (no short bends). Bond each end to the pipe or the rods with clamps in a location so that they may be checked occasionally to see that they are sound mechanically. The wire is stranded for two reasons: First, the stroke is fast enough so that we may consider it a stroke of 25 kHz or greater frequency. Remember, the more surfaces, the greater the current-handling capability. Therefore, the current tends to travel in the outer part of the conductor. Second, the stranded wire is more resistant to accidental cutting.

6. Go back and bond to the antenna and then look around to see which of the projections above the house are of metal and are within 6 ft of the ground wire. These might be vent pipes or chimneys, etc. Connection from the ground wire to these metal pipes is necessary so that there will be no current jumping the gap. Remember that it is the current jumping that creates an arc and therefore heats and causes fires. A bond wire prevents this from happening.

7. The books suggest you run the down wire outsidė the home. I ran mine inside on the basis that the wire can be made more direct to the ground connection and the conductivity of the copper is better than that of any other material the lightning will pass in its travels. Some books agree with this. It is also a means of reducing corrosion, making the installation more pleasing to the eye, and reducing the possibility of someone cutting it down as an act of vandalism. The disadvantages are that the wire is hard to string through the narrow openings, and the bonding must include the ductwork in the attic.

8. If air terminals are used, they should be high enough to prevent danger of fire from the arc.

9. A cloud passing over the area will cause an area of several miles to be charged as it moves. This means an electric current in the ground. As it passes over your area, the wires will also be charged. For this reason it is best not to leave the antenna hanging loose. Ground the lead wires, or install an arrester.

10. Remember that connections can be batteries and will cause corrosion if made of dissimilar metals. Use only accepted connectors and cable clamps. They will be clearly marked Cu or Cu/Al if both metals. Make all materials mechanically secure to prevent loss of protection.

. . . Patzsch ■

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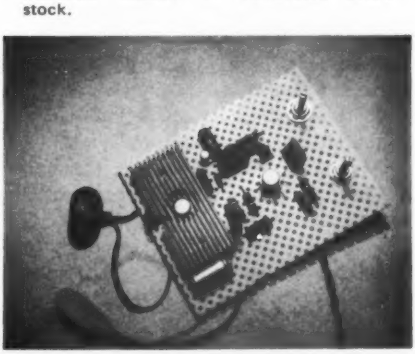
IC RECEIVER ACCESSORY

John J. Schultz W2EEY
40 Rossie St.
Mystic CT 06355

Readily available Motorola HEP units are featured in this compact accessory unit, although other ICs may also be used. The unit is designed to plug into the headphone jack of any receiver (or transceiver) and provide tunable af selectivity, agc and sufficient audio power for direct loudspeaker operation.

Audio frequency integrated circuits provide the opportunity to develop very useful circuit functions–in many instances at a far lower cost than would be possible using discrete components. On the other hand, the inherent nature of the IC housing and the conditions under which it must operate also make the practical realization of a circuit using IC's, in some instances, just as complicated as a circuit using discrete components. This seeming contradiction was experienced by the author in developing the receiver

Power amplifier IC mounted in heat sink is shown on left. FET and associated components are at upper right side of heat sink. Other components are conveniently arranged around dual stage FET. Potentiometers shown on right are miniature type mounted directly on perforated board stock.



accessory unit described in this article. So, even if one has no immediate need to build the unit described, it may prove interesting to still read about and appreciate some of the considerations involved in the use of audio integrated circuits.

General

The accessory unit described was designed as a compact, solid-state unit that could be plugged into a medium to high impedance headphone jack and function as a self-contained unit to provide tunable af selectivity, agc and about 1 watt of power for direct loudspeaker operation. By the addition of a few diodes a simple noise limiter can also be added. For compactness and simplicity, only a resistor-capacitor network was used without any inductive elements to obtain audio selectivity. The resultant selectivity is not as sharp as that provided by a bulky inductor but is quite usable on CW, especially with a transceiver that already contains a steep-skirted crystal or mechanical SSB filter. The fact that the af selectivity is tunable also adds to its usefulness. The agc feature is not absolutely necessary but was added since many transceivers, although their avc cannot be disabled as such, do not provide full agc on CW when the rf gain control is at some intermediate setting, as would be normal if one were using the rf gain on CW as the "volume" control while tuning. The audio output amplifier was included to eliminate the need for going back into the receiver in order to use its audio output stage. Thus, no modification whatever is required to the receiver and the accessory unit can simply be unplugged from the headphone jack when it is not desired for operation.

Circuit

A block diagram of the accessory unit is shown in **Fig. 1**. The basic stage functions are relatively simple. The incoming audio is split into two parts, each going ½ of the HEP592 (a hobbyist version of the MC1535 dual operational amplifier sold as a stereo preamplifier). One section of the HEP592 serves as a level detector with an adjustable threshold. When the positive going portion of the input signal exceeds the threshold level, an output voltage is produced which when rectified is coupled to the gate of a HEP801 FET. The drain-source resistance of the FET is normally quite low but increases to several thousand ohms with increasing negative gate-source potential. This wide resistance variation is used to regulate the gain of the power amplifier IC. This "forward" method of obtaining agc is somewhat different from the usual "backward" method where part of the final output af voltage is rectified and then used to control the gain of a preceeding stage. However, it works just as well and with some experimentation of the circuit time constants, it may even appeal to some as providing more responsive agc action than the "backward" system.

The other section of the HEP592 serves as a tunable af filter. Advantage is taken in constructing the filter circuit of the fact that most "operational amplifier-turned-hobbyist" IC's provide a differential input. That is, so-called inverting (-) and non-inverting (+) inputs. A portion of the input signal is fed to the non-inverting input. The other input is coupled to the output via a tunable audio filter which passes all audio frequencies *except* the one to which it is set. Thus, all other audio frequencies are fed back to the input to oppose wall input frequencies except one frequency. The overall result is an audio peaking stage at the one frequency to which the audio filter is set.

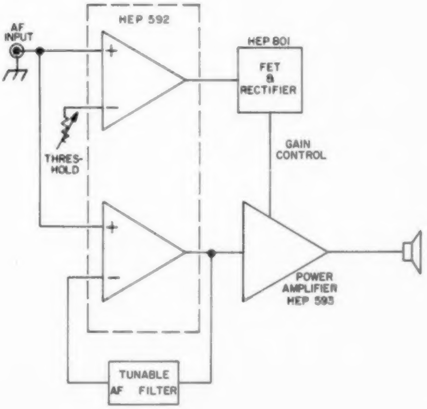


Fig. 1 Block diagram of accessory unit stage functions. Other similar IC operational amplifiers can be used to perform the same functions.

New Products

Automatic ID in Electronic "Fist"

Curtis Electro Devices has announced an advanced mnemonic integrated circuit keyer incorporating an automatic solid-state identification message generator in addition to the basic "Electronic Fist" circuitry. A custom integrated circuit read-only memory, febricated on a single silicon chip less than 0.1 in. square, controlled by three complex medium-scale ICs, provides permanent memory to generate the repetitive calls used by radio amateurs in normal and contest operation.

As an example, the selector might select any one of the three sequences below from a single memory:

- CQ CQ DE WA6JNJ K
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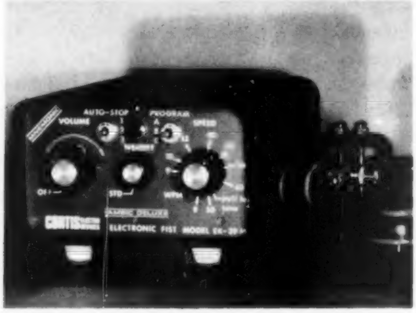
Three auto-stop selections allow continuous cycling or a choice of two stopping points. In the manual mode, the keyer provides 8 — 50 wpm paddle or squeeze keying with dot memory, independent weight control, and iambic character generation. A tap on the straight key of a Brown Bros. CTL combination key initiates the automatic program at the *exact speed and weight* employed by the operator in the "manual" mode. At 20 wpm, a full sequence takes 15 seconds. The sequence terminates either automatically or by a tap on the dash paddle. The unit will operate both grid block and cathode keyed rigs. Power supply, monitor and speaker are built-in. All cables and connectors are provided. The EK-39M mnemonic unit, available either from dealers or direct, is priced at $179.95 complete except for the individually tailored plug-in memory which is ordered directly from the factory per user message instructions. It is priced at $59.95. For more information, write *Curtis Electro Devices, Box 4090, Mountain View CA 94040.*



HEP Replacement Kit

A new universal kit of semiconductors that will replace over 6300 different semiconductor type numbers is now available to service dealers from Motorola's HEP suppliers throughout the country. The kit contains 50 of the fastest-moving replacement semiconductors, according to Motorola HEP sales manager Art Baldensperger. Ten HEP 254s, germanium PNP general-purpose transistors; ten each of the HEP 53, 54 and 55 silicon NPN transistors; and ten HEP 170s (2-5A, 1 kV silicon rectifiers) in Motorola's "Surmetic" package. HEP is Motorola's sales program for making semiconductor devices readily available to the hobbyist—experimenter and to professional service dealers through a nationwide network of authorized suppliers. *Motorola Semiconductors, 5005 E. McDowell Rd, Phoenix AZ 80536.*

(cont. on page 80)

The power amplifier stage is necessary to raise the output level to drive a small loudspeaker and produces about 3/4 watt output.

The wiring diagram of the unit is shown in **Fig. 2**. A 10K potentiometer is used with the agc portion of the HEP 592 IC to set the threshold value at which agc action starts. It can either be brought out as a panel control or left as a trimmer adjustment. The tunable af filter is of the bridged-T type. As shown, a three-unit potentiometer is needed to cover the complete audio range up to a few thousand cycles. One could possibly make only two of the resistor legs variable, but the frequency range will be restricted to a few hundred cycles over which the network is effective. **Fig. 3A** shows an alternative filter network which can be connected between terminals 7 and 10 of the HEP 592 and which requires only one potentiometer. It is rated to be effective from 70 to 10,000 cycles, but only the components specified should be used.

Fig. 3B shows a simple noise limiter which can be connected either before or after the HEP 592. Advantage is taken of the fact that the IC units are operated with a dual-polarity power supply to allow biasing of the diodes for symmetrical clipping.

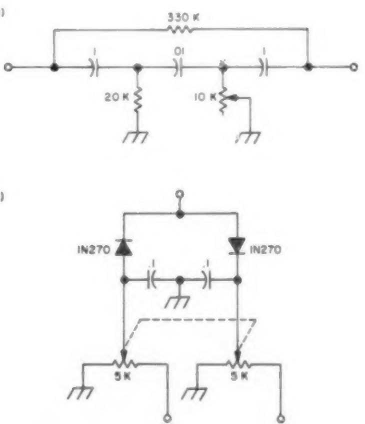


Fig. 3. Simpler audio notch filter (A) requiring only one potentiometer. Capacitors are Aerovox type P123ZNG. Symmetrical noise clipper (B) which can be used at input to unit or at input to power amplifier (pin 4).

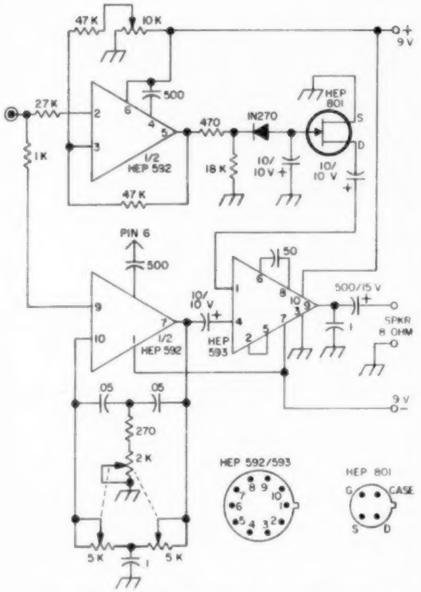


Fig. 2. Wiring diagram of accessory unit. Resistors are ½ watt. Triple section potentiometer used in audio filter is IRC type 45D502MD502MD202.

Construction

The photograph shows one construction layout possible for the unit. Basically, the circuit components are grouped around each IC and directly soldered together. The potentiometers for the agc and af filter are mounted directly on the perforated board stock. The potentiometers shown are actually of a miniature type but normal, less expensive ¼ inch shaft types are quite adequate. Also, although not shown, an IC socket should be used for the HEP592 unit, instead of directly wiring it, for protective purposes.

The use of the HEP 593 power amplifier appears simple from **Fig. 2** and although its connections are not involved, its placement in a unit does present some problems. A heat sink *must* be used and Motorola specifically advises against the simple slip-on fin-type head sinks available for TO-5 transistor cases. They suggest a 2 inch x 2 inch x 1/8 inch piece of aluminum with a center hole drilled to snugly fit over the transistor case. Not having any material available, the author used a heat sink found on a surplus IBM computer board. The index tab was removed

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(New Products cont. from page 78)

The Fantastic Dimmer

Voltaic International Corp. of Dallas, Texas, announces a solid-state electronic lamp dimmer socket. The entire dimmer circuitry is contained within what appears to be an ordinary lamp socket. However, the Volt-A- Lite, using an ordinary bulb, provides a full range of lighting intensity from a low glow to full brilliance. By allowing smooth, continuously variable lighting, it modernizes lamps, provides dramatic contrasts in home or office decor, and adds warmth, friendliness, and a relaxed atmosphere to any room. The Volt-A-Lite can be set low for a night light, adjusted to dim for watching TV or for parties or for romantic dining, turned to bright for reading, or adjusted to any level to suit any individual eyesight.

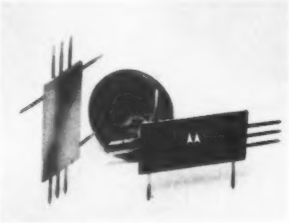
The money-saving features of the Volt-A-Lite far exceed its cost. To begin with, it does away with costly, short-life, 3-way bulbs, which are almost twice the cost of standard bulbs. The Volt-A-Lite lowers electric bills, too, by permitting lower light intensities when desired. Volt-A-Lite makes bulbs last longer, also, because the lamp dimmer socket always comes on at an extremely low level and feeds the current to the filament gradually. This reduces the damaging surge, of high current through a cold filament, that causes bulbs to burn out.

Installation is simple — just like the installation of an ordinary lamp socket. It requires only a screwdriver to remove the old socket and to attach the ends of the lamp cord to the two screw-terminals on the Volt-A-Lite.

The Volt-A-Lite operates at maximum efficiency with a 150W, 120V bulb but lower wattage bulbs can be used if desired.

The Volt-A-Light is Underwriter Laboratory recognized and is fully guaranteed, both parts and workmanship, for one year from the date of purchase. It's been overload-tested at twice its rating and has performed perfectly through 10,000 complete on-off cycles at its rated load. It does not heat up and does not interfere with radio or TV. It even has a current-limitng fuse element so that the Volt-A-Lite components are not damaged when the bulb burns out. The Volt-A-Lite is available by mail for $4.95 from *Voltaic International Corp., 7701 N. Stemmons Freeway, Dallas TX 75247.*

IC Duplexer



A new Motorola duplexer, the MCH5890, operates at frequencies between 400 and 500 MHz with up to 40W input. The MCH5890 features a typical 0.1 dB transmit-mode insertion loss and a typical 25 dB transmit-mode isolation figure. Although its primary purpose is as a transmit/receive switch, the MCH5890 will find use as a monitor network in transmitter circuits, as the sampling unit in afc or agc circuits, or other related communication applications. *Motorola Semiconductor Products Inc., Box 20912 Phoenix AZ 85036.*

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from the HEP 593 and a clean contact area between the flange of the IC and the heat sink established. The IC was then glued into place. Overall, the relatively low voltage gain (18-35) of the IC power amplifier, its cost and the necessity of using a heat sink does not compare too favorably with using two larger case audio transistors which do not require heat sinks at the 1 watt level.

Two 9 volt transistor batteries were used to power the unit shown. The battery potential slightly exceeds the 8 volt operating voltage recommended for the units but seems to cause no difficulty.

Adjustment & Operation

There are no real adjustments that should be necessary if proper layout procedures are followed. Some experimentation of the feedback resistors in the agc amplifier circuit may be necessary to obtain the best action and "bread-boarding" the circuit initially will save time later. The IC's did show some tendencies toward instability if too much coupling were allowed to exist between the various input and output circuits. This is understandable when one realizes that although the IC's are called "audio" type, their actual response extends up to several hundred khz. So, an rf feedback loop can exist which will overload the units but yet not produce an audible indication.

In operation, the receiver af output level is adjusted to produce adequate audio output, but not to the point of overloading the unit. The agc threshold control is set as desired to produce the best agc action when going from a weak to a strong signal.

Summary

Various other operational or audio type IC's can be used for this type of accessory unit so long as the device ratings are not exceeded. The main criteria is that the agc/af filter IC have differential inputs. One could, of course, also use separate IC's for these functions, each with a differential input.

Such a unit adds a significant degree of improvement to the operating possibilities of a SSB transceiver used on CW which does not have real provisions for CW reception. It also provides some very interesting exercise and experience in the many versatile uses to which IC's can be put. . . . W2EEY

Milton Schwartz W2SF
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Flushing NY 11357

INVERTED A ATTIC ANTENNAS

Hardly an issue of any ham radio magazine comes out without some description of a simple and efficient antenna system. I have spent years constructing various types of these systems with varying degrees of success. There is the matter of optimum height, but very often we find limitations as to the area and level at which the antenna can be strung. Then again, weather has much to do with our ambition, especially during the winter with the temperatures hovering around zero, and the snow six feet deep. Rain and the hurricane seasons play their part in delaying the fun of experimenting with the new antenna ideas.

The antennas described below eliminate most if not all of these problems. They also fill certain needs peculiar to the ham fraternity. All of the units are built in the attic of a private home, and are compact, inexpensive, and easy to put up. They are as concealed as an antenna can be for those who need this for esthetic or other reasons. As to height, they are built into the topmost portion of the house and many towers do not go much higher. The big advantage is that you can work on them winter or summer, and no storms can affect them.

My first inspection of the attic showed me that I could not cram in a full-size half-wave antenna in the bands from 10 meters and below. The attic was built with a peaked roof held up by heavy beams. I decided to bend my dipoles on these wooden beams with the apex at the top. The result was the inverted-V dipole antenna.

My interest at the time was to fire up on 15 meters. I was not getting good results with the ordinary dipoles and folded dipoles I had set up outside.

For more rigid mounting and possible broader band operation, and the fact that they are easy to mount, I decided to use ordinary thin-wall electrical conduit for the elements of the antenna. These come in the half-inch size at a standard length of 10 ft and are quite inexpensive. The 10 ft length is short for 15 meters, but with the addition of end-loading or center-loading coils I hoped to be able to get the antenna to resonate within the 15m band.

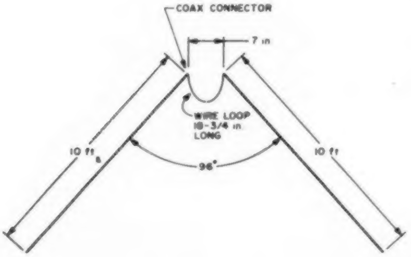

Fig. 1.

The configuration of the elements is shown in the diagram in Fig. 1. The attic beams happen to be exactly 96 degrees from the apex. Each 10 ft element was mounted on two ceramic standoff insulators placed at either end of the tubing. To hold the tube to the standoff a 4 in. strip of scrap aluminum was wrapped around the conduit. The ends of the strip were drilled to accept a screw which tied the strip to the standoff as shown in Fig. 2.

The ends of the coax cable can be soldered directly to the apex elements. However, if it is desirable to change the coax cable to other antennas, coax connectors will make it simpler and less expensive.

Spacing between the two pipes at the apex was found to be better at 7 in. Finding the correct center-loading inductance took quite a bit of time and experimentation. An ordinary length of hookup wire 18¾ inches long soldered between the soldering lug and the center conductor of the coax junction (Fig. 1) gave the lowest swr readings. Figure 3 shows a picture of the apex connections.

I made a few swr checks before trying the antenna and was pleasantly surprised to find them very low.

10m Attic Antenna

I used the attic V antenna on 15m for two years and was so amazed at the results that I decided to see how a 10 meter version (Fig. 4) would work out. No center loading was found necessary. I drilled the element ends and tapped for 8–32 screws and soldering lugs. I connected the coax directly to the apex ends of the elements as shown in Fig. 5.

In cutting the conduit, I found that a pipe cutter did a better job than a hacksaw. The cut ends are cleaner and do not require filing as they would after being cut by a hacksaw. Figure 6 shows how the cutter is used.

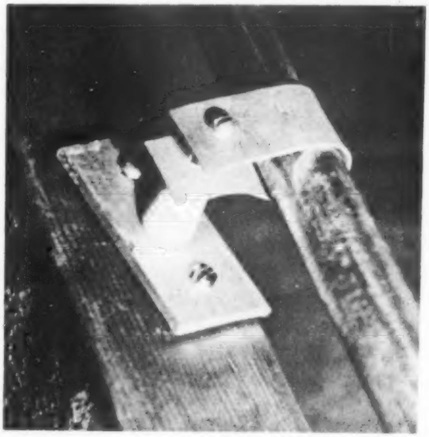

Fig. 2. Strips of aluminum hold the element to the ceramic standoffs.

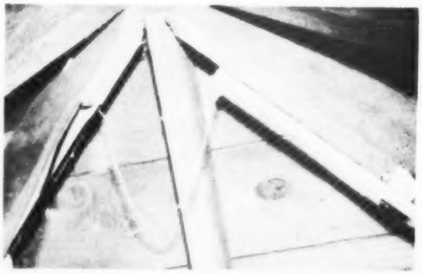

Fig. 3. 15 meter inverted-V apex connections.

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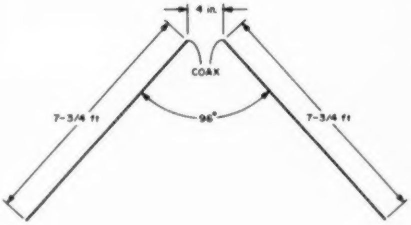

Fig. 4.

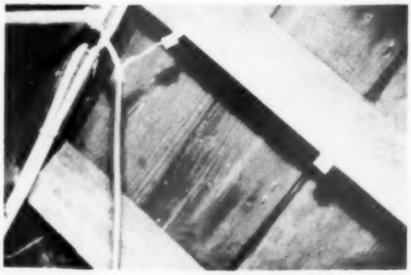

Fig. 5. 10 meter inverted V connections at apex.

20m Attic Antenna

After the successful operation of the two antennas was assured, a more ambitious attempt was made to put a 20m inverted V in the attic. This involved the use of loading coils at both the element ends and the center apex. A diagram of the layout with dimensions for the antenna is shown in Fig. 7.

Two 10 ft half-inch conduits were installed on the attic beams using ceramic standoffs. Spacing between the two pipes

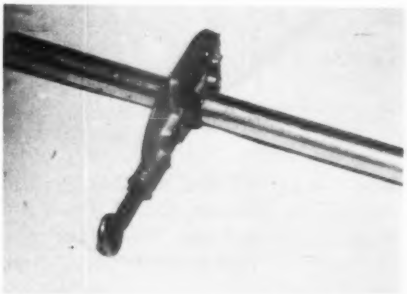

Fig. 6. Using pipe cutter to trim ½" conduit.

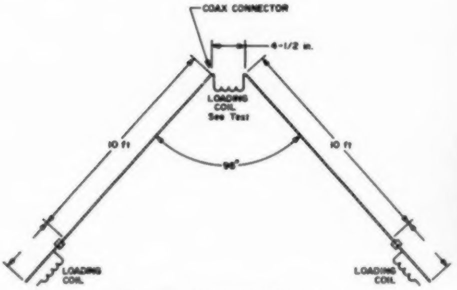

Fig. 7. Antenna layout.

at the apex was set at 4½ inches. At the far ends of the conduit a coupling unit was attached to each element.

Two 6 in. lengths of half-inch conduit were cut and a hole was drilled about ½ in. from one end and 1-1/8 inch from the other end. A metallic standoff was mounted at the hole 1-1/8 inch from the end while a ceramic standoff was placed at the other end.

A B&W air inductor 1¾ inch in diameter (9 turns per inch) was cut to eight turns and mounted on the two standoffs. Construction details are shown in Fig. 8.

When completed, these units are plugged into the conduit coupling with the metallic standoff closest to the antenna element as shown in Fig. 9. At the apex one of the elements was flattened and drilled to accept a coax fitting. The other element was drilled to accept an 8/32 and soldering lug.

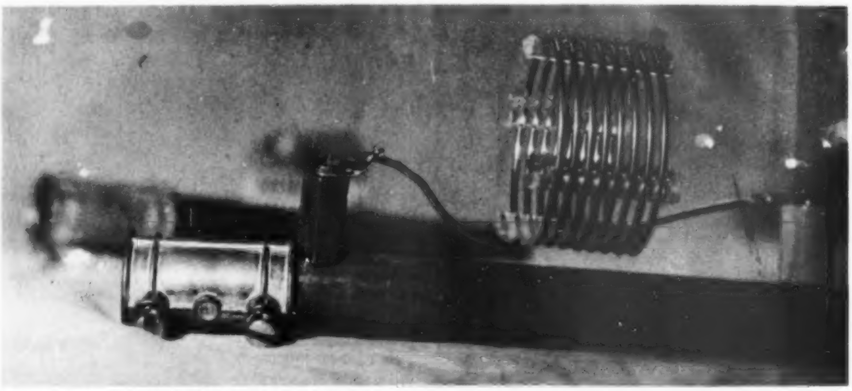

Fig. 8. End loading coil for 20 meter inverted V.

Fig. 9. Coil mounted on antenna element.

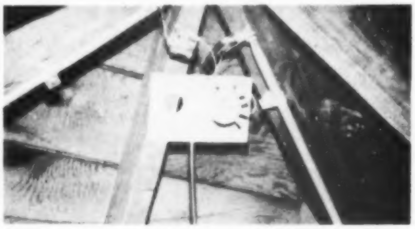

Fig. 10. Center loading at apex of 20 meter inverted V antenna.

At the apex a 5-turn B&W coil (1¾ in. diameter) was mounted between the coax fitting and the soldering lug. Figure 10 shows the mounting at the apex. A switch is also pictured which I used to vary the inductance of the center loading coil when adjusting the antenna for swr.

In my own station I use a coaxial switch to change antennas. I estimate the total cost for the three antennas at less than $15, which is quite good for a three-band instat-change antenna system.

. . . W2SF ■

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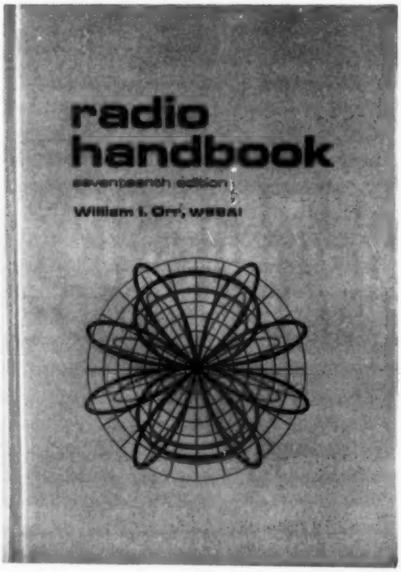

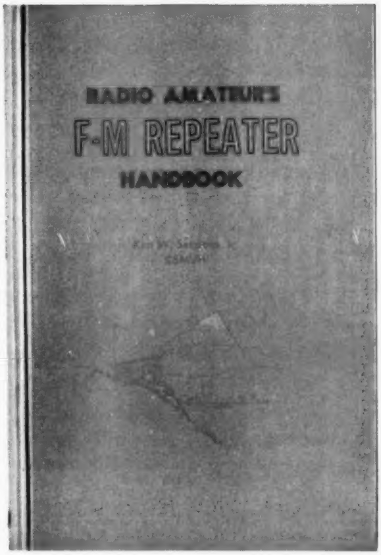

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F. Dale Williams K3PUR
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DOUBLE-BALANCED MIXERS

Although the heart of the single-sideband system, the balanced mixer or modulator, did not originate with SSB, it certainly became more well known to the amateur fraternity when this mode of transmission became popular. In the way of background for the newcomers to amateur radio, or review for the Extra and Advanced classes, the common, single-ended mixer or converter produces three output frequencies. These consist of the original carrier or local oscillator frequency and the two sidebands – products of the sum and difference frequencies of the carrier and modulation. The balanced mixer produces only the two sidebands, the carrier frequency being greatly attenuated by the conversion process. The advantage of the balanced mixer is obvious for SSB operation since we need only to provide a filter to get rid of the unwanted sideband before passing the signal to the final of the transmitter. Balanced mixers are not limited to sideband transmitter use, but find applications throughout the electronic world.

Common Configurations

In Fig. 1 the circuitry of the ring modulator used by telephone companies for many years in landline communications is shown. The older models used metallic copper oxide diodes in the ring formation with balanced input and output transformers. Besides the high signal loss

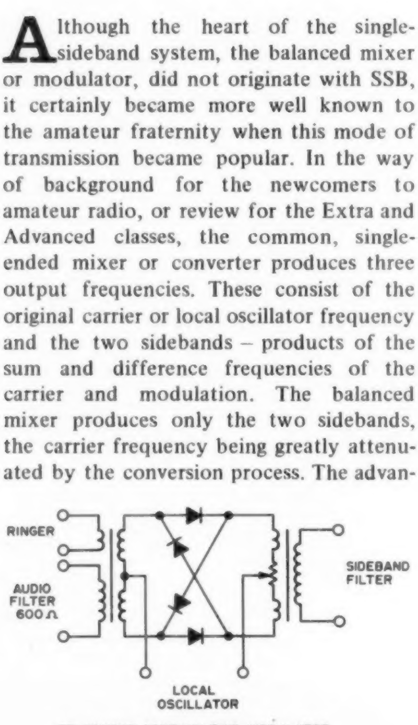

Fig. 1. Telephone company ring modulator.

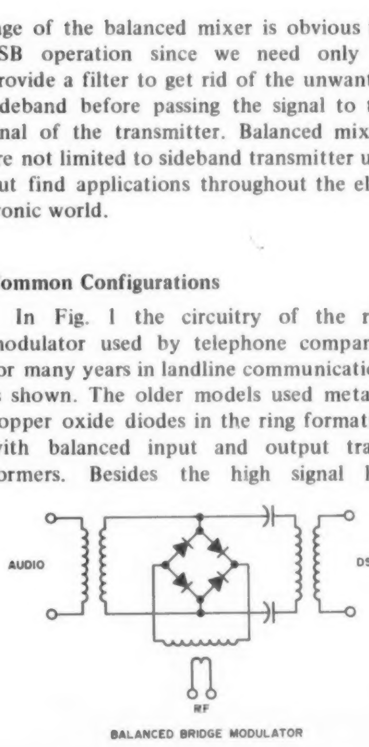

Fig. 2. Balanced bridge modulator.

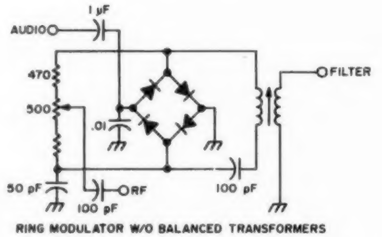

Fig. 3. Ring modulator without balanced transformers.

encountered with these types of diodes and the expensive balanced transformers, the frequency range of the transformers is about 50 kHz. Note that a 100Ω resistor is still used to "balance out" any component variations. Although a high ratio of input vs local oscillator level is necessary to drive this circuit, the output will show a local oscillator attenuation of at least 60 dB.

Less efficient is the bridge type of balanced modulator shown in Fig. 2. Balanced transformers are still necessary in this type of configuration and the diodes should be matched. The signal is effectively shorted by application to opposite sides of the bridge in the balanced condition. The presence of an audio signal unbalances the bridge allowing a double sideband to appear at the output. Carrier isolation may approach 50 dB with matched components.

The most expensive components of the balanced mixers shown in Figs. 1 and 2 are the balanced transformers. In designing a circuit without balanced transformers we not only cut the cost significantly, but also have the oportunity of utilizing an rf input of the desired transmitter output frequency for single band operation, or a frequency more easily converted for multiband operation. A common balanced modulator without balanced transformers, for ham use, is shown in Fig. 3. Notice that the matched diodes are connected in a ring rather than a bridge configuration. Good shielding procedures and matched components give a typical carrier attenuation of 40–45 dB.

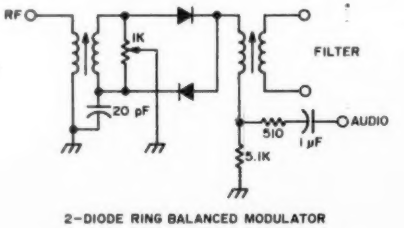

Fig. 4. 2-diode ring balanced modulator.

It is not necessary to use four diodes to form a balanced modulator. As shown in Fig. 4, a two-diode balanced mixer in ring formation is also possible. However, the circuit lacks the efficiency and carrier suppression possible with the previously discussed modulators.

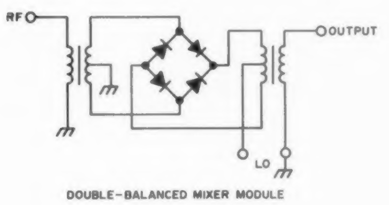

Fig. 5. Double-balanced mixer module.

Thus far we haven't said anything about the possibility of obtaining signals from the output of the balanced mixer other than the double sidebands and the attenuated carrier. Good efficiency and low distortion are possible by driving the mixer with a signal much higher in frequency than the input, and of greater amplitude. The general rule of thumb states that a ratio of 10:1 should be used. Thus, the higher the input amplitude, the greater must be the signal to drive the bridge. Consequently, undesired mixing products are found at the output. Fortunately, the even harmonics are suppressed by the 180-degree phase shift operation of the circuit, leaving only the odd harmonics. Of these, the third order harmonics will be the strongest but should be easily attenuated by the following sideband filter. In other types of mixers, such as the single mixer or unbalanced modulator, both even and odd harmonics are present at the output.

Within the last few years, the balanced mixer has taken on a more modern appear-

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ance, and in some cases, advanced design in the form of integrated circuitry. Much of this change has come about as a result of new or improved components such as the Schottky barrier diode, toroid coil forms, and transistors with greater parameter ranges, notably FETs and MOSFETs. Probably the first new development which contributed to more efficient balanced mixers was the availability of matched diodes bearing a single type number and at a cost which put them in easy reach of the amateur and experimenter.

A number of companies began to offer encapsulated balanced mixers using matched components for less conversion loss and balanced transformers with toroid cores for better isolation. These double-balanced mixers ranged in frequency from 200 kHz to 500 MHz with insertion losses typically on the order of 7 dB and carrier or local oscillator isolation figures of 30–40 dB. The advantages of such a module included no dc power required, relatively economical when compared to iron core balanced transformers, and ease of circuit board mounting. In addition, these modules found application as frequency converters, product detectors, phase detectors, voltage controlled attenuators, and summing networks, to name a few. The double-balanced mixer modules assume the general circuit of Fig. 5. In general, the input/output impedances are 50Ω and the output is dc tapped. This latter characteristic allows the module to be used in such applications as a voltage-controlled attenuator, whereas an incorporated coupling capacitor would preclude such operation. A product detector designed with a double-balanced mixer is

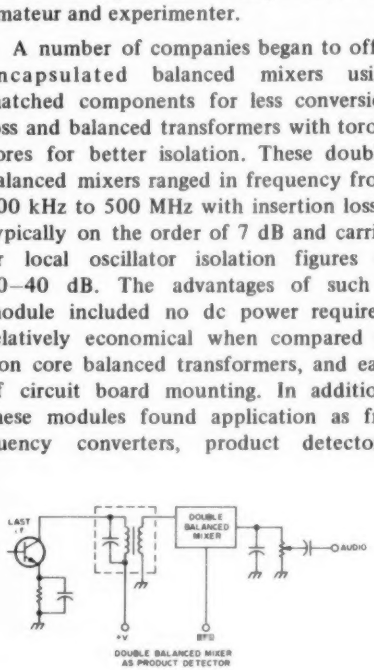


Fig. 6. Double balanced mixer as product detector.

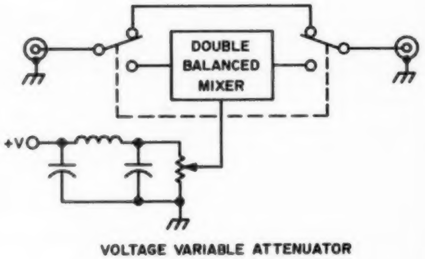


Fig. 7. Voltage variable attenuator.

shown in Fig. 6. This circuit has the advantage of immunity to large signal overloading, but requires a high injection level.

A voltage-variable attenuator can be made by varying the conduction of the double-balanced mixer with applied voltage, as shown in Fig. 7. A potential of 1V is enough to provide approximately 40 dB attenuation. Due to the series connected diodes of the mixer, current should be limited to less than 60 mA. For practical purposes, the attenuation/voltage ratio will not be linear. However, a front panel control can be calibrated to provide the attenuation readout.

Although conversion loss is unavoidable when using diode configurations, transistors lend themselves readily to double-balanced mixer circuits which not only overcome the conversion loss, but also exhibit some gain. The cross-coupled transistor circuit shown in Fig. 8 also does away with the costly balanced transformer. Operation of this circuit is similar to multivibrator action. One transistor is always on while the other is off. As the phase of the carrier wave changes, the on/off state of the transistors also changes, producing a pulse across the common collector load. When the balance control is

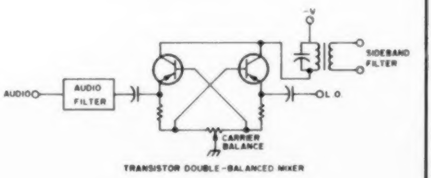
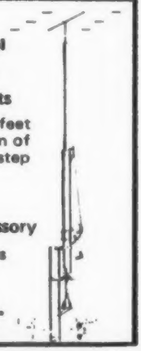


Fig. 8. Transistor double-balanced mixer.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properly adjusted to null the carrier, the output signal will consist of upper and lower sidebands of the two input signals. The undesired sideband and the even harmonics of the inputs are removed by the following sideband filter. Input impedance for the transistor double-balanced mixer is approximately 50Ω while the output impedance approaches 600Ω. A local oscillator/signal ratio of 10:1 is maintained for best efficiency. Isolation of carrier/signal/output when using this circuit, requires short lead lengths and shielded cables. Building the entire circuit in a shielded "black box" with coax connectors may add 10 dB to the carrier/output isolation. A conversion gain of 5–10 dB is possible, but most efficient operation usually produces no more than 3 dB gain.

Even the telephone companies are modernizing their modulator circuitry by replacing the diode ring modulators used for so many years. A number of manufacturers of integrated circuits are producing interesting designs on monolithic substrates of single chips, the whole can being less than the size of a quarter. Amperex Corporation has been producing its silicon monolithic ring modulator/demodulator since 1967. It is known as the TAB101 integrated circuit, and consists of four transistors on a single chip enclosed in a TO-74 can. A possible balanced mixer circuit utilizing the TAB101 is shown in Fig. 9.

Double-balanced mixer applications are limited only by one's initiative. A closed-circuit TV system transmitting terminal as seen in Fig. 10, allows inexpensive short-link transmission. The double-balanced modulator provides double sideband signals of 4.5 MHz bandwidth which are transmitted by cable to terminal equipment.

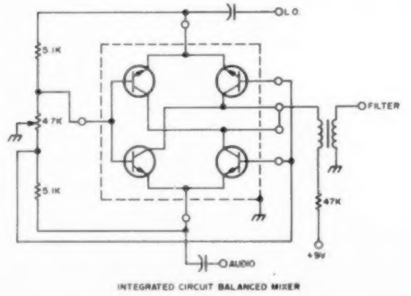

Fig. 9. Integrated circuit balanced mixer.

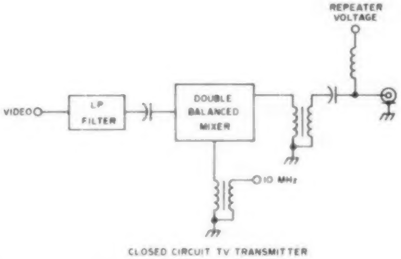

Fig. 10. Closed circuit TV transmitter.

Mototola claims to be first with a true linear, 4 quadrant multiplier integrated circuit. The MC 1595 integrated circuit is designed for uses where the output voltage is a linear product of the two input voltages. Some examples of possible applications include digital multiplication, division, square roots, mean square, and frequency doubling. It may also be used as a balanced modulator/demodulator, amplitude modulator, or electronic gain control.

Motorola has also recently managed to produce an FM demultiplex circuit on a single chip. Although production is limited to Scott for their tuners, such circuits promise to be both readily available and economical in a very short time.

Due to the high input impedance, low power supply voltage and current required, and versatility of such integrated circuits, they are easy to breadboard and provide a solution to bench design. Instead of a small pile of different transistors, now all you need is the IC and a small pile of resistors and capacitors.

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. . . K3PUR ■

Quick and Permanent
TOOL MARKER

Jim Kyle K5JKX

The craftsman is proud of his tools, the saying goes, and with the price of tools nowadays it makes good sense to mark them well, proud or not.

Here's a trick borrowed from professional electronics service engineers which makes it easy to mark tools or any other metal objects quickly yet permanently.

Simply take an ordinary wooden pencil and sharpen it draftsman-style, with a long exposed lead (Fig. 1). Next, rig up a 24V transformer with a utility plug on the primary so that it can be plugged in, and flexible test leads terminated in alligator clips on the secondary winding. The transformer should be rated for at least 1 A, and the higher the current rating the better – but we used one of the bargain specials sold by Radio Shack which happened to be left over from a +24V power supply that never got built, rated at 900 mA.

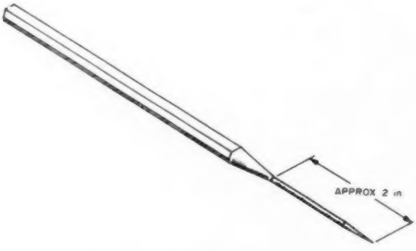

Fig. 1. An ordinary draftsman's pencil with an extended point will serve as the basic "engraving" device. The lead must protrude enough to allow connection of a clip-lead "electrode."

Connect one of the alligator clips to the tool or other metal object to be marked, and the other clip to the exposed lead of the pencil (Fig. 2). Now, using the pencil just about like any other pencil, write your name or other identifying mark on the tool.

The small arc which strikes between the carbon tip of the lead and the metal work surface etches away the metal of the tool, leaving a permanent mark wherever the pencil passes so long as the arc remains struck. It takes a bit of practice to learn to hold the pencil just far enough from the metal to maintain the arc, but you should achieve excellent results by the second try. Take caution – the lead gets hot, and if you keep things going too long the wood of the pencil may burst into flame. Everything cools down more rapidly than a soldering gun, though, when you move the lead away from the work.

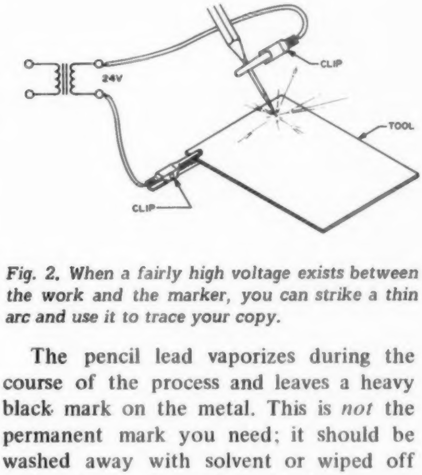

Fig. 2. When a fairly high voltage exists between the work and the marker, you can strike a thin arc and use it to trace your copy.

The pencil lead vaporizes during the course of the process and leaves a heavy black mark on the metal. This is *not* the permanent mark you need; it should be washed away with solvent or wiped off with a dry rag. Beneath the black film, you should find a row of tiny craters, one for each half-cycle of the 60 Hz power as the pencil lead moves over the work – they are the permanent marking.

In addition to using this trick for marking tools and occasionally identifying terminals on breadboard chassis, we found it most convenient for writing identification on the many keys which burden our pockets. You will probably think of many other uses, now that you know about it.

. . . K5JKX■

The Rev. John O. Gardiner W6LZJ
1841 Locust Ave., Apt. No. 7
Long Beach, CA 90806

There is a SANTA But...

Yes, there is a Santa, and I'm going to tell you all about it. It was getting close to Christmas as I picked up a back issue of 73. Naturally, no one in his right mind ever begins reading from the front cover straight through to the last page, and I am no exception to this phenomenon in the habits of the American reader. I had read the *Never Say Die* editorial, and after pondering for a while Wayne's words of wisdom I let my fingers stroll idly where they would among the pages, stopping now and then to read an article about sunspots, carrier (in my SSB signal; never! . . .or nearly never!!) suppression, or that upstart new VHF mode.

Now, I can't tell you exactly when it was or how it happened, but, I must have begun to read the advertisements aloud to myself. Let me warn you now: never do that, and if you do be sure you never say, "Boy, wouldn't that be great to have. Why, every ham in the country would give his eyeteeth to own one of these!"

A few of my friends (even Wayne Green) talk from time to time about ESP. I don't know much about ESP, nor about how it works. Therefore, I must leave it to the gentle reader to decipher in his own mind the probable explanation for these things. Meanwhile, back to the *73 Magazine* and how I found out about Santa.

If you do decide to comment aloud while you're reading the delightful ads, be absolutely certain that you take your time. Don't rush into the experience without due thought and sufficient concentration.

By this time, you may be thinking that this is much ado about very little. Please read on! What transpires here may someday happen to you. As I have said, I can't rightly recall just how I happened to be reading aloud certain comments on the delightful items displayed in between the articles of 73. I had perused with silent longing the "Quality People." Rohn, the largest tower manufacturers in the United States, are best known for foldover and crank-up towers. I don't own a Rohn; I don't even own a tower! On page 113, I literally drooled, as I read about the Classic 36, six element, 10, 15, and 20 meter beam by Mosley Electronics. I don't own a beam any more. I don't even own a rotor, let alone a rotor like the Ham-M listed on page 112.

I had noted all the goodies listed between pages 112 to 122. I might have mentioned aloud that I would like to own a tower, a rotor, a brand new National or Galaxy transceiver, a Swan Cygnet, or even a Henry linear. I even remember thinking that Wayne had done a fine job of listing the products of his advertisers.

Perhaps it was the wonder of it all – that great parade of electronic perfection lined up before me; I may have even pictured them, one and all set in their rightful places side by side in my humble shack. The tower and rotor excepted, my shack wouldn't hold them, but how nice they would appear standing in the yard with the Mosley tri-bander atop and pointed toward Europe.

In thinking back now, had you asked me about Santa, whether I believe in him or not, I would have given you the standard answer. After all who can say how many youngsters read the words of truth as they are expressed in 73? But – and here's the rub – I never gave it a thought that he of all persons would be listening as I read those precocious ads. Who knows now what treasures might now be installed in my shack? Surely, I could have been the envy of hams on either side of the Pacific and the Atlantic not to mention the Antarctic.

Just as I had thumbed the pages of 73 to page 21, someone handed me a BLT (bacon, lettuce, and tomato sandwich). I munched away enjoying the savory treat when suddenly my eyes lit upon the Dow-Key advertisement. Imagine my thoughts as I read about the SP6T, remote 115V ac. One could install this remote controlled relay atop his tower, and with but one length of coax feed six separate antennas one at a time to the rig sitting in the shack. "Wow," I think I said. "Oh, double wow! That must be the ham gift for the ham that has everything." Note carefully what I say next. "Boy, I wish I had one of those."

As it turns out they were fateful words. In my stocking (I have unusually large feet) on Christmas morning. . .you guessed it; a real genuine, shiny, brand new Dow-Key SP6T, remote 115V ac six-position relay.

There *is* a Santa. He was listening. Can you imagine my surprise when I looked in my stocking? No tower, no rotor, no beam, not even any fancy ham gear, still I'm the proud possessor of one of the finest relays ever made.

By the way, OM, if you know anyone who owns a Rohn tower, has a Ham-M rotor, and uses a Mosley Classic beam, but doesn't own an SP6T by Dow-Key, will you ask him to get in touch with me?

. . .W6LZJ

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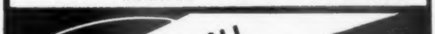

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A close look at the ARRL through the eyes of a man who has been a member continuously for 46 years. . .

Belonging to the ARRL is rather like being a stockholder of a large corporation where you have the privilege and duty to be constructively critical. Notice the word "rather" was used because a large corporation would not countenance the things that have been going on. When you are losing your shirt, losing your image, your growth has stopped, young people are not interested, your people are getting old, and no new blood is entering, when people are using and taking your bands, when your ranks are divided, when you are running a publishing house and not tending to your basic objectives, when every other service that has an interest in using rf spectrum has a representative and lobby in Washington, when you buttonhole a senator and ask him what he knows about amateur radio and you draw a blank, when you have a board meeting where the cards are stacked so that the present ARRL headquarters crew can have time to prepare a defense, and two CB publications, one of which is owned by the same group who owns a ham magazine, recommends taking part of our 2 meter band – things just cannot be right. Believe me, if this were a large corporation, heads would roll and changes would occur.

In the days of Hiram Percy Maxim, when we were not running a publishing house and book store, things went along pretty well. Along with Maxim, came A.A. Herbert, who also was dedicated. Then another name entered the picture, K.B. Warner, and the controversy started within our ranks. As you look back, you can see the jockeying for power within the ARRL headquarters personnel with Mr. Warner succeeding and bringing up his favored few.

It is interesting to note that as you read "200 Meters and Down" and "Fifty Years of the ARRL," they are all good guys, everything was sweetness and light, no controversy – yet the truth of the matter is that these written documents are both by ARRL members who were headquarters people. For you newcomers, controversy swarmed around K.B. Warner, former editor of QST and officer of the ARRL, and his strong methods of ramrodding what he thought was best.

Those Warner days were hectic days. During that period a lot of dedicated hams beat their heads against the wall, just as many are doing today. The Chicago Amateur Radio Club and the Egyptian Radio Club got together and elected two directors. A west coast group got together and published a magazine and printed the other side of the story, but they were not strong enough to effect a change. Their efforts faltered and the ARRL succeeded in killing them off. You don't read about this history in any of the ARRL history publications.

A good deal of the Warner philosophy and work still remains: stacked board meeting agenda, headquarters knowing all the answers, everyone more interested in running a publishing house than saving our bands, without them we don't need a $2 million headquarters building, the ARRL, and its headquarters people.

It is easy to be critical; it's more difficult to supply the answers. You must define the problem before you try to solve it. With this thought in mind, let's suggest a few answers to some of the more obvious problems.

Board Meetings

Why hold them behind closed doors? Why not handle them like a good corporation does? Let's have a report on the status of our hobby at a meeting where every member can attend and vote. What's wrong with democracy? Let's have a good old stockholders meeting like some of the more stormy recent auto company meetings where effective changes were made by the rank and file. How about having a session at the meeting, for open discussion, for the good of ham radio? What's wrong with hearing from some of the brilliant minds found in our ranks? If you cannot set up a stockholders meeting (since we are all stockholders of the ARRL, each should have his voting right on all facets of our business), the very least that should happen is that a new method for handling board meetings be set up so that an inflexible agenda is thrown out and that directors can bring any subject to the floor without being called out of order. All hams should belong to the ARRL; and that takes me neatly into my next subject.

A House Divided

The ARRL represents less than 50% of the total number of amateurs. Thus, how can it truthfully claim to represent ham radio? If you published the same article in all three ham radio publications, you still would not reach all the hams. To make matters worse, even within the ARRL, due to poor leadership at headquarters (or perhaps lack of it) our own ranks are divided. The FCC, with whom we coexist, has lost some of its respect for the ARRL. What do you do to solve this problem? Unfortunately, this problem of a house divided ties very closely into our failing image, the lack of knowledge about amateur radio of the general public and our Washington representatives and foreign governments. The answer to this problem just screams "Public Relations."

Let's hire a public relations man and have his first duty to establish a mailing list of all hams and tell them the ARRL story (of course we've got to clean house before we can tell the story). His first objective is to have all hams belong to the ARRL. In addition to supplying us with the usual handy dandy public relations kit on how to write stories for newspapers he would be the clearing house for important contributions to amateur radio and would disseminate this information nationally. His next duty is to establish a congressional mailing list, a foreign hams mailing list, and others. He does this from his office in Washington. He lunches with FCC and congressional people daily. He takes the train to New York and gets acquainted at the UN and tells the amateur radio story there along with stories from foreign counterparts of the ARRL. This would be the first step in moving our headquarters to Washington, where it should have been in the first place.

Washington Headquarters

With a Washington headquarters, this would be a good time to separate the publishing house from the ARRL, and perhaps QST could then print both sides of the story just as Broadcasting Magazine does for the National Association of Broadcasters. Broadcasting Magazine is the bible of broadcasters and presents a very good version of all sides of each problem. The magazine is separate, owned by another source, specializes in broadcast news, and really is the voice for broadcasting. Incidentally, both the magazine and the National Association of Broadcasters are in Washington, not Newington, Conn.

While we are on the subject of a lobby in Washington, a little insight as to the magnitude of lobbying can be obtained by reading the Congressional Record, Volume 115 #83, dated Wed. May 21, 1969. There are over 5000 names listed, many fine companies and many associations, all in Washington where the action is – not in the wonderful quaint little town of Newington, Conn. where the action ain't. As you go through the names, you find hundreds that could be drooling over the valuable spectrum we occupy. Now pick up the May 1970 Yellow Pages of the Washington telephone directory. There are eight pages of associations and as you meander through them you find hundreds that are associated with some use of the radio spectrum. Take a look at Broadcasting Magazine yearbook for 1970 and find pages of consulting engineers who make their living getting spectrum for their clients, and pages of Washington lawyers doing the same thing. Do any of them have a Newington address? NO! They are where the action is, not where the inaction is. Funny thing, in 5000 lobbyists, 8 pages of people associated with lobbying, scads of pages of people representing spectrum users – *not a single mention of amateur radio!* So let's have the board of directors look into separating the publishing business from ARRL. Let QST be the official organ for all, repeat *all*, amateurs, and at the same time, make a start at Washington representation by establishing a public relations office. Why doesn't the board of directors establish a study group looking toward these goals?

Our Bands are Diminishing

Take a look at the following chart. The heavy load of amateur radio is carried in the 160, 80, 40, and 20 meter bands. Yet, see what has happened here over the years in terms of total bandwidth.

Band (meters)	1927	1938	1946	1963
160	500 kHz	285 kHz	300 kHz	200 kHz
80	500	500	500	500
40	1000	300	300	300
20	2000	400	400	350

This chart does not tell the whole story. Forty meters is practically useless at night due to the intruders in our bands, all there by agreement of the U.S. with no objections at the proper time by the ARRL. Had we had a group whose sole job is to hold our bands, they might have been able to stop many of these intruders before they went on.

This loss of bands is a subject in itself. There is a crying need for a complete plan of attack, not only to keep our bands, but to expand our privileges. The ARRL spent a paltry $100,000, which was eaten up by a few trips to Europe. The broadcasters, only one of the many groups lobbying for spectrum have within their own National Association of Broadcasters (NAB), at least seven very powerful and active lobbies. Their clear-channel AM radio association and the association for maximum service telecasters spend millions to keep their place in the spectrum. We, as amateurs, don't even recognize the full magnitude of the problem. We do not have a permanent group whose sole job is to conserve our radio spectrum.

What's in a Name?

Good business dictates that your name is important. If possible it should reflect your image. Corporations spend millions advertising their trademark and name. Some of the larger, after years of using the same trademark, recognize that to keep in tune with the times they must change. RCA, for instance, has dropped the little dog sitting in front of the phonograph and in addition streamlined their trademark. We hams, in the USA, have doggedly hung on to ARRL. Our British friends have a real slick title, RSGB – Radio Society of Great Britain. The RSGB really reflects the amateur image a great deal more realistically than the ARRL. Amateur has two meanings, one has a nasty intonation, and the other truly reflects our basic purpose; but the general public whom we must sell in order that they will let us keep our bands, always look at us in the derogatory manner. Why not follow Great Britain and use the Radio Society of the USA, or the Institute of Amateur Radio or some other more useful descriptive title. A name is important as that always hits the general public in every news release. As part of our new image let's discard the old and come up with a new name that is in tune with the times. There is nothing sacred about ARRL; if RCA can drop their doggie after selling it for 35 years, I guess we can do the same.

Everyone resists change

The old ARRL dog must learn new tricks or it will be dead. Corporations that have resisted change have long since been buried. The business highway is strewn with the dead bodies of companies who resisted change. We just cannot afford to be like the company that wouldn't stop manufacturing buggy whips. We are living in a dynamic, changing society. Communication is reshaping the world, and we are part of this communication revolution. We desperately need leaders who will not resist change and who have the moxy to fight for change.

Summary

It is obvious that the ARRL needs changes to get in tune with the times. It is also obvious that we must support the ARRL or some new name, as a total group. Divided we can be conquered, united we stand a good chance to survive. Let's ask the embarrassing questions and be sure we give realistic answers. You cannot cure a person who has an ingrown toenail when you diagnose his problem as a cold. The first step is to recognize that a problem exists and then define it and then solve it. I'd like to start with the first question, what is in a name? Next question, what's our purpose in life and in our nation? Next, should QST and ARRL be one and the same? How do we get all amateurs to support one action? Do we need Washington and world representation? Do we have a future? What future? What part will we play in the 1880s? Is there really a problem or is it normal to have less than 50% of the hams belonging to ARRL?

My last comment, and this is strictly personal: For years I have been advocating change because I recognized it was necessary. It is my feeling that the ARRL headquarters people just sit back and hope that I and the others who have been advocating change will run out of steam. What they don't realize, or perhaps don't care, is that if things don't change, they will be out of jobs. The ARRL will be defunct, their pension will be gone, and they will have to live on social security like the rest of us.

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AMATEUR RADIO LICENSE STUDY GUIDE

STAFF

From time to time, the Federal Communications Commission adopts new questions to use in the amateur license exams. 73 has tried to keep up with the FCC in incorporating the new questions into the published "study guide" series, but of course this cannot always be possible. The Extra class series, for example, has already been published, as has the Advanced. This chapter of our series, then, contains a complete list of all FCC study questions. These questions will provide the update needed to complete the formerly published courses, and will provide a preview of questions yet to be covered in the current General class series.

If you're studying for your FCC exam, now is a good time to determine whether or not you're ready for the trip to the FCC office. To help you along, we'll not present answers – paraphrased or otherwise – this time around. If you can answer the questions presented here, you're certainly ready to tackle the real thing. If you can't answer them, it's time to go back to your book-cracking. Got your pencil ready?

NOVICE STUDY QUESTIONS

1. What is the maximum input power permitted to the final stage of the transmitter in a station licensed to the holder of a Novice Class license or operated by such an operator?
2. What is the maximum penalty for a violation of the rules and regulations of the Federal Communications Commission?
3. On what frequency bands may the holder of a Novice Class license operate an amateur radio station?
4. On what frequency bands may the holder of a Novice Class license operate an amateur radiotelephone station?
5. What is the log of an amateur station, and what information must it contain? How long must it be preserved?
6. For how long is an amateur Novice Class license valid and may it be renewed?
7. What are the rules and regulations regarding the transmission of improper language, false signals, or malicious interference?

8. What are the rules and regulations regarding purity and stability of emissions?

9. How must the transmitting frequency of a station licensed to the holder of a Novice Class license be controlled?

10. What are the rules and regulations regarding the measurement of the frequencies of the emissions of an amateur radio station?

11. Who may be permitted to operate the transmitter of an amateur radio station licensed to the holder of a Novice Class license?

12. When may an amateur radio station be used by a person who does not hold a valid license?

13. What is the maximum permissible percentage of modulation of an amateur radiotelephone station?

14. At what intervals must an amateur station be identified by the transmission of its call sign? May any transmission be made without identification of the station?

15. When is notice of portable or mobile operation required to be given, and to whom in each case?

16. What are the recognized abbreviations for: kilocycles, megacycles, Eastern Standard Time, Greenwich Mean Time, continuous wave, frequency modulation, amplitude modulation?

17. What is the relationship between a fundamental frequency and its second harmonic; its third harmonic; etc.?

18. What is the relationship between a cycle, a kilocycle, and a megacycle?

19. What instrument is used to measure: electrical potential; electrical current; electrical power; electrical energy?

20. What is the purpose of: a modulator; an amplifier; a rectifier; a filter?

21. What is meant by: amplification; modulation; detection; attenuation?

22. What is the purpose of: a radio-frequency choke; an audio-frequency choke; a filter choke?

23. How is the actual power input to the tube or tubes supplying energy to the antenna of an amateur transmitter determined?

24. Why is a rectifier and filter required in the plate power supply system of an amateur transmitter when operated from alternating current?

25. What is a frequency multiplier?

26. What are the undesirable effects of over-modulation in radiotelephony?

27. What is a "parasitic" oscillation?

28. What is a "key-click filter" and when should it be used?

29. What is Ohm's Law?

30. What is the relationship between the frequency and wavelength of a radio wave if its velocity in space is 300 million meters per second?

31. What symbol is used in the Amateur Rules to designate amplitude modulated telegraphy without the use of modulating audio frequency (on-off keying)?

32. What is the ruling regarding eligibility for re-examination?

33. What factors are commonly responsible for h armonic radiation and what practical means can be used to detect and correct such condition?

34. How are radio signals transmitted over great distances?

35. International radiocommunication by way of amateur stations is subject to what restriction(s)?

36. What functions do capacitors perform?

37. Why are height limitations placed on antenna structures for amateur stations?

38. What methods are available for determining whether the transmitter output frequency is within the authorized frequency band?

39. What is the most likely defect of a tube which has proper heater voltage at the tube socket, but which fails to warm up?

40. What precaution(s) can be taken to reduce the possiblity of shock hazard in electrical equipment?

41. The plate voltage to the final stage of an amateur transmitter is n ormally measured between what points in the circuit;

42. When is one way communication permissible?

43. What is a Hertz? kiloHertz? MegaHertz?

44. What are some correct ways to call and answer other amateur stations via telegraphy?

45. What are some common Q signals and what purposes do they serve? What do QRA, QRM, QRN, QRS, QRT mean when transmitted as questions via telegraphy?

46. What important functions do diodes perform?

47. What units are used to measure capacitance?

48. How are transistors made, used, and diagramed? What are some common transistor parameters?

49. Why is impedance matching necessary?

50. What is chirp and how can it be remedied in a c.w. transmitter?

GENERAL CLASS STUDY QUESTIONS

1. Questions based on Part 97 of the Commission's rules.
2. Of what use is a bleeder resistor in amateur equipment?
3. Define skin effect. How can this phenomena be minimized?
4. List some operating procedures which can be employed to minimize interference and congestion of the amateur bands.
5. Describe the operation and usage of a cathode follower.
6. How does frequency tolerance affect band edge operation?
7. What is impedance matching and why is it important?
8. How is the plate circuit efficiency of a vacuum tube determined?
9. What is amplitude modulation (AM)? How is the intelligence conveyed in an AM signal?
10. What is meant by the ripple frequency of an a. c. power supply voltage?
11. What is a third party agreement?
12. How does a zener diode operate and of what use is it in amateur equipment?
13. Define standing wave ratio (SWR). How can the SWR of a line be determined? How are the SWR of a line and its characteristic impedance related? Name some factors that affect the characteristic impedance of an air-insulated parallel-conductor transmission line.
14. What is meant by the maximum plate dissipation of a vacuum tube?
15. What is a decibel?
16. What is a harmonic? List ways of minimizing harmonic generation in frequency doublers, vacuum tube amplifiers, transmission lines, and antennas.
17. What is a crystal resonator?
18. How do electolytic capacitors operate and why are they widely used in power supply circuitry?
19. What symbols does the Commission use to designate how the main carrier of a signal is modulated?
20. What are some possible causes of excessive plate current in a Class C power amplifier?
21. List several characteristics of a vertical quarter-wavelength antenna.
22. What is TVI? How can it be remedied if the amateur station is at fault? If the TV receiver is at fault?
23. How can transistors be used in electronic equipment? What is the beta of a transistor? Compare the elements of a transistor to a vacuum tube's
24. What is meant by percentage of modulation? What is the maximum legal limit to which an amateur transmitter can be modulated?
25. Describe briefly how oscillators operate. What are the most common types of oscillators and how do they differ from each other?
26. Why is a center-tap return connection employed on the secondary of a transmitting tube's filament transformer?
27. Define OHM'S law. How does it relate to resistive and reactive impedance?
28. Describe ways of equalizing the reverse voltage drops across series connected silicon diodes.
29. What is the maximum legal d.c. power that can be delivered to the final amplifier of an amateur transmitter? How is this power determined?
30. Define instantaneous power, average power, sideband power, audio power, and peak envelope power. How is each related to the voltage and current that produced it? How is each related to the unmodulated carrier power?
31. What is meant by the bandwidth of a signal? Compare the maximum necessary bandwidth occupied by a cw signal, an SSB signal, a double sideband signal, and an ordinary voice signal.
32. What is neutralization and how does it contribute to proper amplifier operation? What procedure should be followed to properly neutralize an r.f. amplfiier?
33. What are the distinguishing features between series tuned and parallel tuned resonant circuits? How is the resonant frequency determined? Define the "Q" of a resonant circuit.
34. How does an a.c. power supply produce a d.c. voltage? Distinguish between a choke-input and a capacitor-input filter and compare their operating characteristics. What is dynamic regulation and how can it be improved? How do the output voltages of a full-wave center-tapped and a full-wave bridge rectifier compare?
35. How do resistors combine in parallel and in series to give total resistance? Capacitors? Inductors?
36. How does voltage division occur across series connected resistors? Capacitors? Inductors?
37. What does it mean to connect circuit elements in series? in parallel?
38. What is inductive reactance? Capacitive reactance? How is their value determined? How do like reactances combine in series? In parallel?

39. Describe the transmissions characteristics of the amateur bands below 30 Mc/s. List several propagation factors that influence signal transmission and reception in these bands.

40. List the basic stages of a conventional superheterodyne receiver and tell what function each stage performs.

41. How is the approximate length of a half-wave dipole related to its resonant frequency? Compare the operating characteristics of a half-wave dipole and a grounded antenna.

42. What do high- and low-pass constant-k filter circuits using balanced and unbalanced pi- and T-sections look like?

43. How can amateur equipment be protected from lightning discharge?

44. What are the basic stages of a single sideband (SSB) receiver and transmitter and what purpose does each serve?

45. List the three main classes of amplifier operation and explain the use for which each class is best suited.

46. What are "images" in a receiver?

47. What is meant by "flat-topping" of a single sideband signal and what are some possible causes of it?

48. What does grid current flow in a Class A amplifier indicate?

49. Briefly discuss how a multiband "trap" antenna operates.

50. How can the power input to the final amplifier of an SSB transmitter be determined?

51. Compare the operating features of the grounded grid and grounded cathode amplifiers.

52. How is the bandwidth of an FM signal related to the bandwidth of the modulating audio signal?

ADVANCED CLASS STUDY QUESTIONS

1. Questions based on part 97 of the Commission's Rules which governs the Amateur Radio Service.

2. What is meant by the Standing Wave Ratio (SWR) of a transmission line? What is a good indication that a high SWR is present on a transmission line? Where is the best point on a long transmission line to measure the SWR?

3. What methods are most commonly used to generate single sideband signals? Draw a block diagram of the filter method showing all essential stages. How can a low frequency SSB signal be converted to the desired transmitting frequency? On what frequencies do SSB transmissions become more difficult? List some of the advantages SSB proides over double sideband operation.

4. How do the voltage, current, and impedance behave along a transmission line with an SWR of 1?

5. What are harmonics? How can the generation of excessive harmonics be avoided? Which class of amplifier operation is most favorable to the generation of hamonics?

6. What factors affect the state of ionization of the atmosphere?

7. What types of emissions can be received with selectible sideband receivers?

8. The ratio of the peak envelope power to the average power in a SSB signal is primarily dependent on what factor?

9. How can receiver sensitivity and selectivity be improved?

10. How close to the edges of a certain amateur band can you safely operate a VFO c.w. transmitter if you are using a frequency meter having maximum possible error of 0.01 percent?

11. A transmission line that feeds an antenna has a power loss of 10dB. If 10 watts are delivered to the transmission line input, how much power is delivered to the antenna? List possible causes of power loss. How can the SWR of the line be made as low as possible?

12. How do parastic oscillations affect circuits? What can be done to prevent or eliminate parastics?

13. What is backwave radiation? How can it be eliminated?

14. Define maximum usable frequency.

15. A resistor, capacitor and inductor each have 100 ohms of resistance or reactance. What is the equivalent series impedance of these three elements? How would the addition of a reactive element to a purely resistive circuit affect the sum of the voltage drops around a closed loop in the circuit?

16. What do oscilloscope patterns showing 33%, and 75% modulated signals without distortion look like? Show trapezoidal and AM envelope patterns.

17. What are some common types of oscillators employed in amateur equipment? How can each be identified in circuit diagrams? What part does feedback play in these oscillators? What points in the circuits should be coupled to provide good feedback? What affect would a reactive load have on an oscillator's output frequency? What can the value of the d.c. voltage across an oscillator's grid-leak resistor reveal about the oscillator's performance?

18. Why is neutralization important in amplifiers? What points in an amplifier circuit should be coupled to provide good neutralization?

19. When is an amplifer operating Class A? Class B? Class C? In which amplifier stages of an amateur transceiver are these classes normally used?

20. What happens to even-order products in r.f. linear amplifiers?

21. What is the third party agreement? What countries have such agreements with the United States?

22. What are lissajous figures in oscilloscope operation? How are the lissajous loop patterns produced on the face of a scope related to the frequencies applied to the scope's plates?

23. How are bypass capacitors used? How should their impedance compare with the elements they shunt?

24. How can TVI caused by cross-modulation be remedied? Where in a TV receiver should a TVI filter be mounted to best reduce television interference?

25. How can SSB signals be amplified with little or no distortion?

26. A superheterodyne receiver having an intermediate frequency of 455 kc/s is to be adjusted to receive a signal on 3900 kc/s. What frequencies can the oscillator be set to, to give a beat signal at the intermediate frequency?

27. What factors affect the peak envelope power of a transmitter?

28. How does a full wave bridge rectifier operate? What does the schematic diagram of a full wave bridge rectifier circuit using solid state components look like?

29. When can a low pass filter be installed in a coaxial cable without causing a large power loss at the fundamental frequency?

30. What standard formula is used to determine the resonant frequency of an antenna? How can the resonant frequency of an antenna be increased? Decreased? Compare the center impedance characteristics of the inverted V, the half-wave dipole, and the folded dipole antennas.

31. A 70 ohm half wave antenna operating on a frequency of 7300 kc/s is to be matched to a 50 ohm transmission line. Calculate the characteristic impedance of a quarter wave matching section and the physical length of the antenna at the frequency given. What is the SWR between the antenna and transmission line without a matching section?

32. Power dissipation in what part of a transistor warrants careful observance of power ratings?

33. Define the shape factor and selectivity of a crystal lattice bandpass filter. How are the shape factor and the selectivity related?

34. Compare the pentode, tetrode, and triode for use in an r.f. amplifier stage. Give advantages and disadvantages of each.

35. What is meant by describing a radio wave as horizontally or vertically polarized? Which type is most suitable for sky and ground wave propagation? How should an antenna be mounted to best receive each of these types of radio waves?

36. Which amateur band is the most suitable for daytime communication over a distance of about 200 miles? What amateur frequencies between 7 and 148 Mc/s inclusive, are most affected by weather conditions?

37. Should a voltmeter have high or low internal circuit resistance? Explain .

38. A transformer with 115 volts applied across the primary terminals has a primary to secondary turns ratio of 10 to 1. If a 5 ohm load is connected to the transformer secondary, the reflected primary impedance is what? How much voltage appears across 1/2 of the turns of the primary? What factors determine whether or not a transformer having a center-tapped high voltage winding can be used in a bridge rectifier circuit?

39. What functions does a variable-mu tube perform in an r.f. amplifier stage of a receiver?

40. Compare transistors and tubes. What are the advantages and disadvantages of each?

41. How do noise limiters operate? Where should they be positioned in a receiver to be most effective?

42. How do inductors combine in series and in parallel? Capacitors in series and parallel? Resistors in series and parallel?

43. Define frequency deviation in FM transmissions.

44. How does the peak-envelope power (PEP) input of an amplifier used for cw compare to the PEP of an SSB amplifier when using the maximum legal d.c. power? During the application of the single-tone test to a linear amplifier, how does the average power input to the amplifier relate to the PEP produced?

45. What are the advantages and disadvantages of using the same antenna for receiving and transmitting?

46. What is the vacuum tube counterpart of a (1) grounded-base circuit; (2) grounded emitter circuit; (3) grounded collector circuit?

47. How does the sunspot cycle affect wave propagation? What are the best frequencies to use for day and night, short and long distance communications during the cycle?

48. How does automatic gain control operate? When can it be used for SSB operation? CW operation?

49. How should a linear amplifier be adjusted for linear operation?

50. How is the power output of a 100% modulated AM signal related to the carrier power?

51. Why does a type 6146 tube have 3 prongs connected to the cathode?

52. What parameters affect the directional pattern of a beam antenna?

53. What are some precautionary measures that should be taken before replacing faulty circuit elements?

54. Compare the operating characteristics of wirewound and carbon type resistors.

55. List ways of protecting amateur equipment from damage induced by electrical storms.

56. Define single and double conversion. What is an intermediate frequency (i.f.)? In a receiver, how does the image frequency relate to the desired signal frequency?

57. Explain why the grid wiring in an r.f. transmitter should be as far removed as possible from the plate circuitry.

58. What is a dummy antenna? How can it be of use to amateur operators?

59 What is meant by percentage of modulation? What determines if a carrier wave is under- or over-modulated?

60. What affect would a self-oscillating buffer stage have on a transmitter's output frequency?

61. What is meant by the "effective value" of a voltage? "Peak to peak value"?

62. What is a wave-trap? Draw some common wave-trap configurations.

63. What circuit condition is indicated by a high direct current reading in the grid meter in the final Class C amplifier stage of a transmitter?

64. Briefly discuss the advantages and disadvantages of using paper, mica, air, and ceramic type capacitors. What happens to a circuit when a capacitor develops a leakage resistance?

65. Discuss the characteristics of a series resonant circuit; a parallel resonant circuit.

EXTRA CLASS STUDY QUESTIONS

1. What are sideband frequencies? During 100% sinusoidal amplitude modulation, what percentage of the average power is in the sidebands? How is the sideband power related to the percentage of modulation?

2. Who do the modulation envelopes of amplitude-modulated waves with 75%, 100%, and greater than 100% modulation look like?

3. How may a limiter be employed in an FM receiver?

4. What precaution(s) should be taken when measuring the rectified grid voltage in an oscillater with a d.c. voltmeter?

5. What is meant by frequency shift keying and how is it accomplished?

6. Why is there a practical limit to the number of stages that can be cascaded to amplify a signal?

7. What are A5 and F5 emissions? On what amateur frequencies can be emissions be transmitted? Can A5 emission be transmitted satisfactorily using one sideband only?

8. How does amateur TVI usually affect television reception?

9. Describe briefly the basic sections of a single sideband (SSB) transmitter. In what section of a properly operating SSB transmitting system is distortion most liekly to originate? In what section is nonlinearity most likely to originate?

10. Define what is meant by the time constant in a resistance-capacitance circuit? How is the time constant determined?

11. How does a squelch circuit operate? Draw a commonly used squelch circuit.

12. An oscilloscope is used to study the relationship between the input and output of an amplifier produced by a voice signal. How would the scope pattern display a linear relationship between the input and output signals?

13. Draw a block diagram of an RTTY system showing the primary function of each stage. What is the proper way of identifying an RTTY transmission? What is the most widely used frequency difference between the mark and space frequencies in a conventional RTTY transmitter?

14. How can the two-tone test output of a linear amplifier be used to tell if a transmitter is working properly? Show scope patterns for optimum, overdriven, and underdriven amplifer conditions.

15. Define the alpha cut-off frequency of a transistor. How is this parameter of use in circuit design?

16. What are inductive and capactive reactance? How are their phase angles related? How does their reactance affect actual power dissipation in a circuit?

17. How does the positioning of a powdered iron tuning slug affect the frequency of the oscillator it is tuning?

18. Define the deviation ratio in a frequency modulated signal.

19. What type of signal will be produced when the output of a reactance modulator is coupled to a Hartley oscillator and multiplied in frequency?

20. How would the reception of a single sideband signal be affected if the carrier is not completely suppressed? How can spurious signals in the output of the mixer stage of an SSB transmitter be suppressed?

21. How does the best frequency oscillator affect the tuning of a single sideband signal?

22. Can a lossy transmission line be used to transmit signals? Explain.

23. How can you distinguish between a product and an envelope detector?

24. How can a receiver be adjusted for SSB reception when the receiver does not have a product detector?

25. How do mica and paper dielectric bypass capacitors compare at different frequencies?

26. Discuss the advantages and disadvantages of electrolytic versus paper filter capacitors.

27. Where in a receiver circuit should a limiter/blanker stage be placed to provide maximum utility?

28,What frequency should a crystal oscillator circuit be tuned to for maximum stability?

29. What are microwave frequencies? What type of oscillator is commonly used to generate microwaves?

30. What are some of the factors that affect the field strength of a signal from a radiated antenna?

31. What factors determine the frequency at which a quartz crystal will oscillate? List some of the advantages of using crystals in amateur equipment.

32. Explain the properties of a quarter-wave section of r.f.transmission line. How would these properties change if the output ends of the section were short-circuited?

33. How should a wave trap be connected to a receiving antenna circuit to attenuate an interfering signal?

34. Why are synchronizing pulses transmitted with television signals?

35. How may an amateur check his transmitter for spurious sidebands?

36. How can the safe power input to a crystal oscillar circuit be determined?

37. Define the term decibel. How is the decibel used for voltage and power calculations?

38. How are the emitter, base, and collector of a transistor biased for amplifier operation? How are they biased for cutoff (open circuit) and saturation (short circuit)?

39. How do N-P-N type transistors differ from the P-N-P type? How does their bias differ?

40. How can the output circuit of a transmitter be adjusted to increase or decrease its coupling to the antenna system?

41. How do filters attenuate harmonic emissions?

42. List several advantages and disadvantages each for Class A, Class B and Class C amplifier operation.

43. What are some different types of noise voltages encountered in amateur receivers? How is each type generated.

44. What are current and voltage characteristics along a transmission line when it is matched and mismatched?

45. How do receivers for remote control of objects and regular type communications receivers differ in basic operation?

46. What is the vacuum tube counterpart of a (1) grounded-base circuit; (2) grounded emitter circuit; (3) grounded collector circuit?

47. What useful functions does a balanced modulator perform in a radio transmitter?

48. How does the directivity of an unterminated "V" antenna and parasitic beam antenna compare?

49. If a crystal lattice bandpass filter has bandwidths of 3 kc/s at the 60 dB points and 1.5 kc/s at the 6 dB points, calculate the shape factor. At what frequency is the best shape factor achieved in a crystal lattice filter?

50. What would happen if the grid-bias supply of a Class C modulated amplifier was suddenly short-circuited?

51. How do trimmer and padder capacitors affect the low and high frequencies in receiver tuning?

52. What is the phase relation between the input and output signals in the common-emitter, common-base, and common-collector transistor circuits?

53. How can a transmitter be tested for self oscillation? What precautions should be observed during testing?

54. How can unwanted VHF resonances in a transmitter amplifier be moved from

TV channel frequencies?

55. A 70 ohm transmission line is connected to a 35 ohm antenna. Calculate the standing wave ratio (SWR), the reflection coefficient, and the percent reflected power. If 10 amperes are flowing in the antenna terminals, what is the current in a transmission line node? How is the SWR related to the forward and reverse current flow?
56. What is a grid-bias amplifier? Should the source of fixed bias have a high or low internal resistance? Explain.
57. Of what importance is the signal-to-noise ratio of a receiver? At what radio frequencies is this ratio most important?
58. What are Aurora-reflected VHF signals? If such a signal is heard, what does it sound like?
59. What is meant by percentage of modulation? What determines if a carrier wave is under- or over-modulated?
60. How does a cathode-ray tube operate? What magnitude of voltage is normally used to bias the plates of a cathode-ray tube? What purpose does this magnitude of bias voltage serve?
61. What are some causes of the excessive production of harmonics in r.f. amplifiers? How can these causes be remedied?
62. What effect does a transmission line which is not properly terminated have on the plate tank circuit of a transmitter?
63. How are reactance tubes used?
64. How do phasing condensers help stabilize cyrstal filter circuits?
65. What means may be employed to measure low frequencies? High frequencies? VHF and UHF?
66. How are grounded-grid amplifiers used in electronic circuits? List some advantages and disadvantages of their use. Describe the input impedance characteristics of a grounded-grid amplifier.
67. What constitutes a parasitic antenna element?
68. What is the image-response of a receiver? How can it be reduced?
69. What is a third party agreement? What countries have agreements with the United States?
70. What effect will extending the low-frequency audio response of a signal have on the design of an SSB transmitter?
71. List some different types of beam antennas.
72. What radiotelephone transmitter operating deficiencies may be indicated by a decreasing antenna r.f. current during

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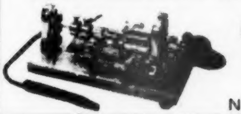

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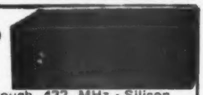

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modulation of the final r.f. amplifier?

73. What improper operating conditions are indicated by the upward or downward fluctuation of a Class A amplifier's plate current when a signal voltage is applied to the grid? How can this be corrected?

74. What improper operating conditions are indicated by the upward or downward fluctuation of a Class A amplifer's plate current when a signal voltage is applied to the grid? How can this be corrected?

75., What may be the cause of a decrease in antenna current during modulation of a Class B r.f. amplifier?

76. What determines the skip distance of radio waves?

77. How can parasitic oscillations be prevented?

78. Give some proven methods of harmonic reduction in transmitters.

79. Describe briefly some well known types of antennas and antenna systems used by amateurs which do, and do not, reduce harmonic radiation.

80. What must the value of an inductor be to cancel a capacitive reactance of 12.6 kilohms at an operating frequency of 2 Mc/s?

81. What is meant by "end effects" in an antenna? How can they be compensated for in half-wave antennas?

82. What are the bandwidths normally used for A1, A3 (single and double sideband), and F3 (narrowband) type emissions?

83. Describe briefly how an ac power supply produces a d.c. output voltage. Discuss the merits of using choke-input versus capacitor-input filters in power supplies. How does the leakage resistance of the capacitors affect the output voltage? Also, what is voltage regulation as related to power supplies?

84. Compare silicon and vacuum tube diodes. What is meant by the "forward voltage drop" of a conducting silicon diode?

85. What is push-pull amplifier operation?

86. For what purpose is a Q-multiplier used in amateur equipment? What major factors affect the Q of a coil? Of a circuit?

87. How can the final amplifier of a transmitter be tested for self-oscillation?

88. How does a frequency converter operate?

89. What visual observation within an operating vacuum tube's envelope would indicate that the tube is gaseous?

90. Questions based on Part 97 of the Commission's rules.

. . .Staff ■

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(Letters continued from newspages)

I must agree with the people you castigate for their pressures, which you say killed the Swan-1011. It is indeed heartening to see outrage among the amateur consumer, the bread and butter of Swan Electronics. Reaction of consumers in other areas similar to this is sorely needed. I commend Swan for its decision to discontinue this equipment and exercising good judgment.

This was not written to knock Swan. That organization, if it is not the most respected name in its field, at least represents a high water mark. But let's not market CB equipment under the guise of amateur radio equipment. Call it what it is and give that segment of the market quality equipment as dependable and as legal as we now have. I do not find the concept of free enterprise and free marketing alien. But there is enough amateur radio equipment available already which can be put to improper use — why add more?

Thank you for your patience. Keep 73 as comprehensive and as thought-provoking as it is now. I am sure it will continue to grow both in eminence and in volume.

Mike WB8BOI,
1951 Burns Ypsilanti MI

73 is always happy to publicize all facets of every issue. My editorial expressed my true feelings, and without regard for the relative repercussions of readers and/or advertisers. Perhaps some of these letters have evened the odds a bit.

. . . Ken

Although I agree with both your and Swan's basic premise that an 11m monitor would be a good indication of 10m band openings, this could be done just as well with a single crystal-controlled CB receive channel that is busy enough to be useful, and yet it is of little or no interest to bootlegging CB'ers. Also, if Swan was not contemplating a CB market, why was the rig advertised in CB magazines? The three points brought out in your editorial are also rather faulty. First, any CB'er that would spend the money to buy the 1011 is probably capable of converting it or finding someone who can. Second, several CB'ers have been heard on 10m recently (an advance patrol checking out a new, wide-open territory?). The reason few, if any, of the illicit 10m operators have been apprehended is the same as

You apparently don't know much about the average CB'er. 'Not one CB'er in two hundred. . . ' You ARE alseep! What would have been closer would have been: ". . .Would have any trouble finding those two wires going to the range switch back wafer". As to the CB'ers 'joining the hams on Ten': Not JOIN — but use Ten — when there were no hams on, late at night when all the hams are sacked out! As for the hams on CB: Yup; listen sometime. The guys on CB talk about their KWM-1s, and wKs all day long. Many of these guys have both ham and CB tickets, but use a code name instead. Lastly, as for the innocence of Swan: Why do they call it the 1011 rather than the 1050 or 310 or some such number more closely fitting their conventional nomenclature? Why is the dial so well calibrated for CB? Why is the ac supply and speaker built-in? Why are both sidebands provided for, when most hamband rigs provide only one per band? Why are the CB channels numbered rather than in MHz or kHz?? Ask yourself these questions if you haven't already, which is, to me, obvious. One thing abou. your 'lunatic fringe': we're for the most part one jump ahead of you in the think department. And we seldom jump from opinion to opinion as the money interests dictate, in the manner of some of you non-lunatic types. Bravo. No, I'm all for the manufacture and sale of the Swan superpowered CB rig, because I have spotted from the start just what the underlying purpose is behind the CB band: That is a spectrum for people too dumb to get a ham ticket, and with no

often tedious, thankless work? I personally knew a League director (one whom you unjustly criticized some years back). Even though we often disagreed on some of our ideas he was an honest, and hard working individual, truly dedicating his spare time in the interests of ham radio. His only operating was in occasional MARS work. You think it is a crime, apparently, to not be active on the air.

When an individual holds down a demanding job, raises a family, keeps his home in repair, works diligently to maintain a college ham station in spite of heavy, official pressure to abolish it, and takes an active interest in promoting the success of a college radio club in addition to his responsibilities as a League director, when is he *supposed* to find time to operate? This man, whom you so thoughtlessly critized, felt it his obligation as a League director to attend many clubs and hamfests in his jurisdiction where he was conspicuously found listening to the ideas and suggestions of his constituents. He often had to make long trips away from his family in the pursuance of his duties, to sit long and tedious hours at meetings at ARRL. The only money he received for those efforts was a partial payment of his gas money!

Even in your more innocuous articles you seem to have to throw shit in somewhere! A prime example appears on the news page. Are you people so stupid as to think no one uses code? Have you invented a new means of transmitting "smoke signaling, semaphore, drumbeating, and letter writing" via radio (other than by facsimile or ATV)? I think not! If I'm wrong, I dare you to print the mechanism in your next issue. (The FCC does not test the use of the English language or speech skills). To me, this little snide remark was thrown in by an angered, biased, bigoted individual who would, if he had his own way, abolish code entirely from ham radio. It seems so to me for the simple reason that

My feeling is that a helter-skelter system of getting what the League calls a thorough reading of amateur sentiment should not be acceptable to League members. I have been involved in conducting advertising and consumer reaction surveys for years for a billion-dollar organization. I maintain that a uniform method must be adopted in order to come up with a meaningful reading. In the case of the League they let each director spin off on his own without uniform direction. Perhaps they wanted to make sure that the results would parallel their predetermined decision. Frankly, I feel certain that they had their minds made up before the survey was even conducted.

Al W4YHB,
Box 1909, Hendersonville NC

I have been progressively disillusioned with ARRL and QST, but not for the reasons you are. In fact, I am of the opinion that incentive licensing is one of the few good things they have promoted. QST has gone downhill in the past few years; in its senility it has run endless articles on the museum, the wouff-hong, etc; club doings, manufactured gear, etc; with very little material for the amateur. I hope that 73 doesn't mind a little constructive criticism: I blew a whole buck the other day on my first 73 in years, hoping that your initial burst of vitriol at the League had burned itself out. It is one thing to stir up a controversy to build circulation, and quite another to keep harping away for years on viewpoints which are, in the final analysis, merely those of a couple of guys in New Hampshire and not divinely etched on tablets of stone. I refer, for example, to the article in the "News" wherein you report that the FCC refused to lower the code requirements for the extra class licenses, a development which I heartily concor. Your writer then has to add the somewhat asinine comment: "which leads one to wonder why the FCC does not require today's

You got your nerve saying that Director Dannals hindered ham radio. I know him personally and like him, he was nominated and elected by a single petition which proves he's best for the job or is it 73's greed, because Harry wouldn't let you put your booth in the convention (Hudson). I see why you are against incentive licensing, because for every 2 Generals there's 1 Advanced and maybe 0.6 Extras. You can really appeal to the majority (Generals) in trying to boost your magazine overnight. You know as well as I do that Advanced with little studying is easy to obtain. I am 13 years old and have my Advanced ticket. You hold one yourself. As I close this letter I remind you to be a little less greedy and because a man (our director) refuses to let you in, you strike him down without reason but only to retaliate. If you think Harry is not worthy, prove it!

P.S. We did. See Mr. Virgo Himself editorial, December issue.

Bravo!!! I was tickled pink when I saw your notice on do-nothing-directorships. I support the ARRL but not all the people who claim to represent it. The director mentioned is certainly not one of my favorite hams. When I lived on Long Island I was not able to have a rig on the air. I had some important traffic to get out so I went to this fellow's house. He was very curt and told me he wouldn't be able to put this traffic on any net. Somehow, if he is unable to support public service how can be represent amateur radio? Why not take a close look at all ARRL officials when they come up for reelection? In particular, there must be a large number of SCM's (one I am acquainted with) who are not the best of all candidates for the job. Why do they get reelected? The standard answer is "They are nice guys from the good old days and they have been SCM for a long time." That's a pretty sick reaconverting it or finding someone who can. Second, several CB'ers have been heard on 10m recently (an advance patrol checking out a new, wide-open territory?). The reason few, if any, of the illicit 10m operators have been apprehended is the same as the reason that few of the bootleggers that stay on the 23 CB channels are ever halted: they're not kind enough to use identification that the FCC can use to trace them! They don't have enough men to catch the mistakes of legal operators, much less deliberate violators that would have to be tracked down individually. Third, I know of many amateurs who would take extreme delight in loading up a high-power transmitter for a couple of hours on any CB channel. These inexcusable lids are the same type that willfully jam emergency traffic because they hate nets, and other nice things along the same lines.

The above did not prompt me to write this letter anywhere near as much as K6MVH's reference to the "lunatic fringe." One of the leaders of the anti-1011 movement was WA6KZI, the ARRL SCM for Los Angeles — one of the foremost fighters for reform within the ARRL's local structure. It was also backed by ARRL Director John Griggs, a ham whose bid for reelection is supported by 73 in the same issue in which your editorial appeared. In two fair-sized Southern California clubs, the Palisades and Inglewood ARCs, there were few, if any, members that thought the 1011 a good idea. Some of the Southland's most responsible amateurs are members of these two clubs. And these are well-informed men and women, not lunatics! I consider myself a 73 supporter, so I hope you take this letter as it is meant to be taken — as constructive criticism. It is a needed irritant that may someday bother the ARRL into something really constructive, as well as being an interesting experiment in the expression of free speech. However, I think that you should worry more about alienating your readers than losing one Radio Today advertiser.

Dan WA6FQC,
3630 Bentley, L.A. CA

and sale of the Swan superpowered CB rig, because I have spotted from the start just what the underlying purpose *is* behind the CB band: That is a spectrum for people too dumb to get a ham ticket, and with no real reason to have business-band, and it keeps the clods fairly well clear of both services. However, there *are* good CB'ers, that can hardly be denied. Yet the facts are that the reason self-policing doesn't work on CB is that all CB'ers have something to hide from their fellow CB'ers; so far be it from any one of them to crack down on 'The Bobcat' working skip on a restricted channel with a huge linear, because, why, they've got a linear hidden in the attic themselves!

So much for CB; I'm in favor of not only restoring the license structure so that a General Ticket will amount to something; we NEED a paid lobby in Washington. Whatever happened to the IoAR?I am largely in agreement with those who oppose the ARRL; I think the ARRL is a good example of a parasite killing the host. I still can't see how a nonprofit organization can have a stock portfolio!! The ARRL is phoney through and through, and the sooner all the hams find it out and act accordingly the better off we all will be.

Bill K9FOV,
424 Bomberding, Lafayette IN

DANNALS, THE LEAGUE, ETC.

I favor just and honest criticism (backed by documented fact with nothing conveniently left out solely to prove someone's emotional feelings), *not* the type you print. Much of what you print is often either misleading, not true, or exaggerated out of proportion. No damned wonder. Dannals wouldn't be in favor of allowing you in the convention. I will no longer allow you in my home after my subscription expires. Why not support amateur radio and all its many and diversified facets instead of trying to fragment and tear it apart? Which one of *you* is a League director? Why not? Is it because you don't make enough money from it? Is it because it is hard and

snide remark was thrown in by an angered, biased, bigoted individual who would, if he had his own way, abolish code entirely from ham radio. It seems so to me for the simple reason that the statement was so ridiculously absurd and out of place. It is the boring repetition of such trite and inaccurate crap throughout your magazine that soon leads one to begin to doubt the veracity of *anything* you have to say, even if it may be true. Don't you see that if you had legitimate beefs about things, and commented truthfully about them without twisted falsehoods, half-truths, and asinine statements, people would not then begin to doubt your veracity? Your attitude on CW is reminiscent of the childish AM vs SSB arguments which used to plague our phone bands!

Steve Conn
412 Palstead, Westfield NJ

It is possible to express opinions without being vulgar, you know.

. . . Ken

For a number of years I felt that much of the criticism aimed at the League was not justified, but I have changed my mind. It took only two letters to the League to realize what a shallow-minded group of so-called executives are heading up the activities that are of grave important to amateurs around the world.

Why have I changed my attitude? Back in September I wrote a letter to the League on the "It Seems to Us" column, September issue. I specifically challenged a statement which was in response to this question: "Why, then did the League's board reject expansion (of the U.S. phone bands)? Answer: "because a *thorough* reading of amateur sentiment showed no widespread desire for affirmative action." Then they continue ". ., at the board meeting, directors reported on sentiment within their divisions. Some had taken direct mail polls of membership opinion; some only samplings; some relied on club councel and similar organizational channels."

class licenses, a development which I heartily concor. Your writer then has to add the somewhat asinine comment: "which leads one to wonder why the FCC does not require today's amateurs to be skilled in SUCH OTHER UNRELATED COMMUNICATIONS media as smoke signalling, semaphore, drum-beating, and letter writing." Aside from the ill-manners involved in injecting editorial bias into news articles, the writer of your article should know that there is no media of communication totally unrelated to any other. The requirement that the Extra class be proficient in code is a good one. Anyone who has heard the "voice-only" (disk-jockey type ham) struggle to maintain communications when signals are weak, and then compared it to the real communicator who uses the key to find a clear channel, will realize that CW has definite uses, even in the phone band. If your goal is to crease disk-jockey hams, with their manufactured rigs, cute phonetics, etc., then technical knowledge and code requirements are superfluous.

I have been looking for a mag rich in technical material. I had hoped that 73 would forget the politics and Wayne Green editorials, but such is not the case. Those of us who travel for a living find Wayne's adventures very unimpressive, and it seems the waste of a dollar to read such editorials as in the November issue — something about Women's Lib — I never did finish it.

You people at 73 seem so very, very opinionated! You are so certain that what you say is the ultimate, final word; you blast out at those who disagree with you in such a shrill manner as to discourage all discussion. You are taking all the fun out of ham radio. I note most of the letters you print are those bearing orchids, so doubt if this will see the light of day.

Ben W7FNE,
Box 103, Tolovana Pk OR

Didn't the editorial make you stop and think?

. . . Ken and Wayne

they get reelected? The standard answer is "They are nice guys from the good old days and they have been SCM for a long time." That's a pretty sick reason to elect a fellow to office. Don't vote unless you know the candidates. Why put in someone who will give you only mediocre representation? I really hate to see these people consistently abuse their position by exerting influence in the name of the ARRL. I am sure one SCM I know "rewards" his friends for their support in all sorts of ways, such as making strong suggestions towards their receiving "amateur-of-the-year" awards. This is an endless list of misdoings and I won't belabor the point.

I don't mean to sound like sour grapes on the subject of the ARRL. I have applied for life membership (same with 73). I only hope that those people who represent Newington are the best possible people for the job.

Bob Harper W1FKP

I'm enough of a prude to not enjoy hearing most four letter words used on the air, except a heartfelt damn or hell. What I call obscene is a picture of the napalming of jungle villagers, or the wasted bodies of African children being systematically starved; or the murder of a man, be he a president or a villager defending his right to live. That is an obscenity charge which has substance, since the purveyors are doing it for money. The obscenities of the ham fraternity, by comparison, are small boys experimenting with the language. They outgrow it, or the FCC monitors can be alerted.

A "heated discussion" on politics, sex, or religion can't be condemned either, since many ideas are born in the telling and if there is one thing this country needs, it is ideas, good, bad and in-between. If I can make someone think, I may make him unhappy and I suppose this is bad. But I'm unconvinced that it is.

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10	$\boxed{11}$	$\boxed{12}$	13	14	⑮	⑯
⑰	⑱	⑲	⑳	㉑	22	23
㉔	㉕	㉖	㉗	28	29	$\boxed{30}$
31						

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CANAL ZONE	14	7A	7	7	7	7	14	21	21A	21A	21A	21
ENGLAND	7	7	7	7	7	7B	14	21A	21	14	7B	7
HAWAII	21	14	7B	7	7	7	7	7B	14	21	21A	21A
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JAPAN	14	7B	7B	7B	7	7	7	7B	7B	7B	7B	14
MEXICO	14	7A	7	7	7	7	7	14A	21	21A	21A	21
PHILIPPINES	14	7B	7B	7B	7B	7B	7	7	7B	7B	7B	7B
PUERTO RICO	14	7	7	7	7	7	14	21	21	21	21	14
SOUTH AFRICA	14	7B	7	7	7B	14	21	21	21A	21	21	14
U. S. S. R.	7	7	7	7	7	7B	14	21	14	7B	7B	7
WEST COAST	21	14	7	7	7	7	7	14	21	21A	21A	21

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AUSTRALIA	21	14	7B	7B	7	7	7	7B	14A	21	21	21
CANAL ZONE	21	14	7	7	7	7	14	21	21A	21A	21A	21A
ENGLAND	7	7	7	7	7	7	7B	14A	21	14	7B	7B
HAWAII	21	14	7B	7	7	7	7	7	14	21	21A	21A
INDIA	7	7	7B	7B	7B	7B	7B	7	7B	7B	7B	7B
JAPAN	21	14	7B	7B	7	7	7	7	7	7B	7B	14A
MEXICO	14	7	7	7	7	7	7	14	21	21	21	21
PHILIPPINES	21	14	7B	7B	7B	7B	7	7	7	7B	7B	14
PUERTO RICO	14	7A	7	7	7	7	14	21	21A	21A	21A	21
SOUTH AFRICA	14	7B	7	7	7B	7B	14	21	21A	21	21	21
U. S. S. R.	7	7	7	7	7	7B	7B	14	14	7B	7B	7B

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CANAL ZONE	21	14	7	7	7	7	7	14	21A	21A	21A	21A
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HAWAII	21A	21	14	7	7	7	7	7	14	21	21A	21A
INDIA	7B	14	7B	7B	7B	7B	7B	7	7	7B	7B	7B
JAPAN	21	14	7B	7B	7	7	7	7	7	7B	7B	14A
MEXICO	21	14	7	7	7	7	7	14	21	21A	21A	21
PHILIPPINES	21A	21	7B	7B	7B	7B	7	7	7	7	7B	14A
PUERTO RICO	21	14	7	7	7	7	7	14	21A	21A	21A	21
SOUTH AFRICA	14	14B	7	7	7B	7B	7B	14	21	21A	21	21
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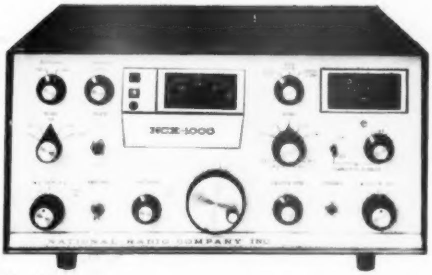

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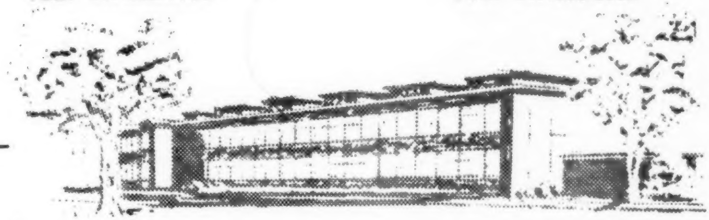

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NATIONAL RADIO CO., INC.

At last—Drake quality in a
VHF FM Transceiver

DRAKE

Marker Luxury

The best of the Japanese, the Marker Luxury VHF FM Transceiver is built for and distributed and backed by the R. L. Drake Co.

- **Exceptional receiver**
- **Backed by R. L. Drake**
- **Complete package for . . .**

$329.95

Includes transceiver, two channels supplied, mobile mount, microphone, coax cable and antenna.

SPECIFICATIONS

General

Frequency Coverage	144-148 MHz
Number of Channels	12 Channels, 2 supplied Channel 1 Receive 146.94 MHz Transmit 146.34 MHz Channel 2 Simplex 146.94 MHz
Modulation	Frequency Modulation
Transmitter Control	Push-to-Talk
Power Drain	AC: Receive 6 Watts Transmit 50 Watts DC: Receive 0.5 Amps Transmit 4 Amps
Power Source (Built-in)	AC: 117 Volts Factory Wired 220/240 Volts 50-60 Hz DC: 13.5 Volts ±10%.
Dimensions	7⅞" W x 2¾" H x 10¼" D.
Weight	8¼ lbs.
Standard Accessories	Dynamic Microphone, Antenna, Connector Plug, AC/DC Cord

Transmitter

RF Output Power	15 Watts
Frequency Deviation	15 KHz maximum
Frequency Stability	±.001% or less
Spurious Radiation	Greater than —80 dB below Carrier
Frequency Multiplication	12

Receiver

Receiver Circuit	Crystal-controlled Double Conversion Superheterodyne
Intermediate Frequencies	1st 10.7 MHz, 2nd 455 kHz
Input Impedance	50 to 75 Ohms
Sensitivity	0.5 µV or less for 20 dB S+N/N ratio 1 µV or less (30 dB S+N/N ratio at 10 kHz deviation with 1 kHz modulation)
Spurious Sensitivity	At 40 kHz separation
Audio Output	Greater than −80 dB 0.5 Watt with 10% or less distortion.

See at your distributor, or write for details . . .

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